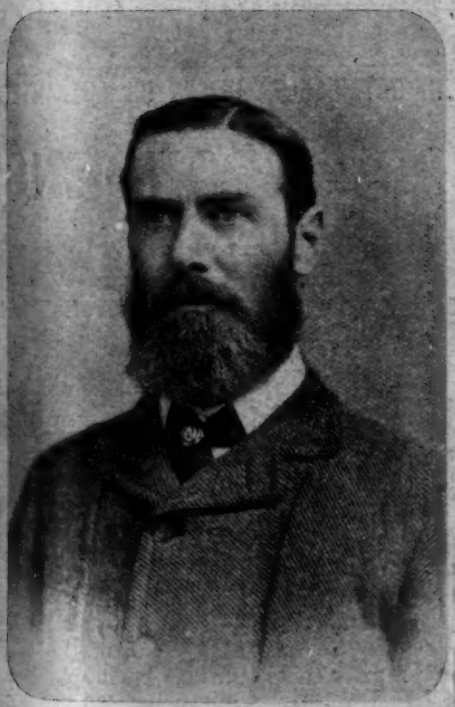
STER AT SWANSEA—SEE FIRST PAGE OF THIS NUMBER.

THE PRACTICAL TEACHER



T. G. ROOPER, H.M.I.S.
(See Modern Educational Reformers, p. 564.)

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'Knowledge is proud that he has learned so much,
Wisdom is humble that he knows no more.'—COWPER.

VOL. XVII. No. 10. APRIL, 1897. { PRICE, 6D. / POST FREE, 8D.

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THE CONFERENCE TOWN OF 1897.

SWANSEA.

AN old 'Swansea Boy,' now a London teacher of some prominence, writing lately to an old friend, commences :—'Now that Swansea is the hub of the Union's Universe for the time being, I presume you are very busy.' Granting that this quaintly-put statement is true, and that thousands of teachers are directing their thoughts thitherward, and hundreds are enjoying the anticipation of an early visit, the following attempt to present some of the salient features of the locality may be acceptable.

The Welsh name of the town—Abertawe—(mouth of the Tawe), is easy even to an Englishman, but 'Swansea,' though so seductively simple in sound and in appearance, has brought many a student of Trench to grief. Through that long period of our history, when every man was a law unto himself in the matter of spelling, the word has been spelled in upwards of 80 different ways, the favourites being Sweinesheie, Sweynseye, Swaynesey, and Swanzey. It first appeared on the Corporation books as Swansea in 1738. Our noted local antiquarian, the late Colonel G. Grant Francis, F.S.A., held the word to be of Scandinavian origin. There are several historic traces of visits of the Danes to this coast. One Sweyne, a Dane, used the bay for sheltering his ships, and so it was known as Sweyn's Eye or Inlet. Several local-place names support this hypothesis. In the 15th century it was known as Caer Wyr (the fortress of Gower), thus forming with Castell Llwchwr (Loughor), seven miles away, on the opposite side of the neck of the Peninsula, a strong defence for Gowerland. The great Roman military causeway, Via Julia, ran through Nidum (Neath) and Leucarum (Loughor): tradition has it that a good road of Roman construction crossed the Tawe by a ford, near the centre of the present town. Coins and other relics lend truthful colour to the belief that Swansea existed in the days of ancient Rome.

Between A.D. 1200 and 1700 Swansea received nine charters—two from Lord Marchers, five from Kings, and two from Lord Protector Oliver Cromwell; eight of these interesting public documents are in the muniment room of the Corporation. The minute book of the Corporation, on May 19th, 1648, says, 'There came into this towne the truly Honourable Oliver Cromwell, Esq., Liftenant Gennerall of all the Forces of this Kingdome of England under the command of the Parliament, Lord of this Towne, the Seigniory of Gower and Mannor of Killvay.' This confiscation of the estates of the Marquis of Worcester has long since reverted to the Ducal House of Beaufort.

Oliver Cromwell's second charter, 1658, gave Swansea the privilege of having a distinct Representative in Parliament, and Mr. William Foxwist was its first M.P.

Modern Swansea is situated on the banks of the Tawe, principally on the right side and on the margin of the bay, which is crescent-shaped, with a coast-line of about 18 miles, the major horn to the west being the bold islet on which stands the Mumbles Lighthouse. The whole of the coast is fringed with hills of moderate height and bold outline, varying much in distance from the shore. At the Mumbles the rugged limestone rocks, towering picturesquely, in places bar all passage between them and the blue sea, while toward Swansea they recede a mile or more, culminating in their greatest elevation (600 feet) in Town Hill and Kilvey Hill on the west and east banks of the Tawe. There are two sides to Swansea markedly in contrast :—the sea, running from east to west, and the river from north to south. The valley of the Tawe, with the North, South, and East (or Prince of Wales') Docks, at its seaward end is given up to the demands of vast mineral trade. The town has long been widely known as a great metallurgical centre. It must suffice here to name the minerals and metals handled in the works :—Tin, copper, lead, spelter, zinc, silver, gold, nickel, cobalt, iron, steel, and coal, not to mention the subsidiary products of patent fuel, sulphuric acid, sulphate of ammonia, naptha, paraffin, creosote, and oxalic acid. Seaward and westward are the residential and newer parts of the town, with wide tree-planted streets, parks, and open spaces for recreation, well-built commodious houses, and all the other appertenances of modern civilized life. The shape of the town, squeezed in between the hills and river and bay, is necessarily somewhat irregular. The plan has not inaptly been compared to a huge gridiron with its main bars running westward and parallel to the bay; one side on the sea-shore

the other tipped at an angle of 30° resting far up the hill-side. The handle of this imaginary monster, instead of conforming to the usual practice of standing at right-angles to the main body and proceeding eastward, diverted by the river, suddenly turns north, and under the names of High Street and Neath Road, traverses the industrial works for about three miles.

The Hamlet of St. Thomas, on the east side of the river, has grown, within the last 25 years, into a suburb of ten thousand inhabitants, mainly depending upon the great and extending business of the Prince of Wales' Dock.

Four railway companies have separate termini in the town :—the London and North-Western, through Shrewsbury, connects us with the North ; the Great Western with Bristol and London ; the Midland with Hereford and Worcester, and the Rhondda and Swansea Bay Railway with the teeming valleys of Glamorganshire.

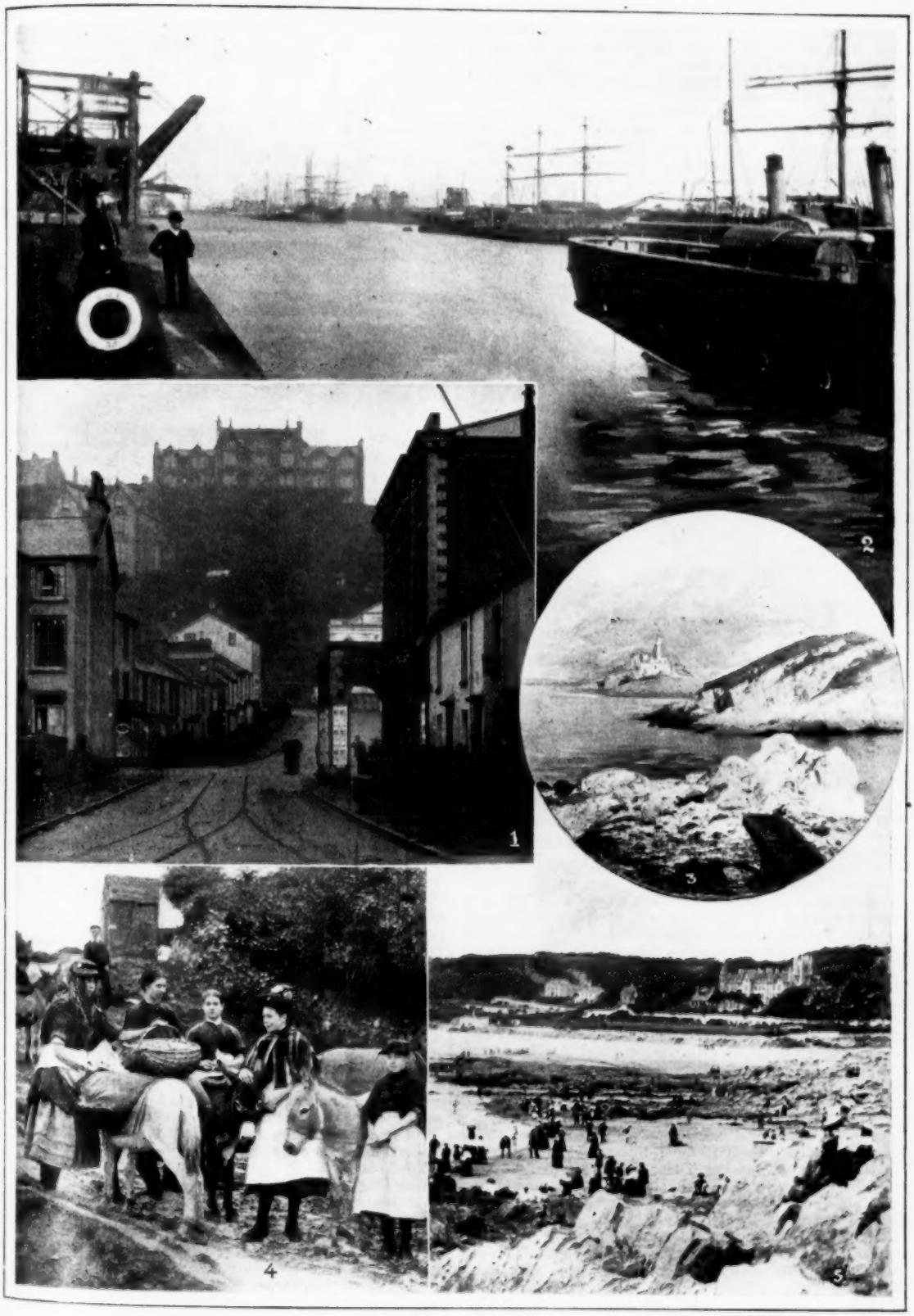
The population, which at the last census was 90,000, is very mixed in nationality. The sturdy men of Devon and Cornwall rub shoulders with the 'Canny Scot' ; 'little Ireland' supplies a large number of labourers for the works ; Belgians, Germans, and French are numerous, and Welshmen are everywhere. All know more or less English. The Welsh language is kept alive by the passionately eloquent preaching at the Chapels, and the teaching in the Sunday Schools, not forgetting the enthusiasm of the natives for all that is Welsh. 'Wales for the Welsh' is still a cherished idea in many breasts.

The point of vantage to view the town and bay in one panoramic picture is from the deck, or better still, for adventurous spirits, the mast-head of some full-rigged clipper, home from San Francisco with wheat for Weaver and Co., and lying in the roads for the first high tide to carry her bravely into the North Dock ; but, if not able to compass this, fail not to visit, as often as convenient, the West Pier, *when the tide is in*, where you will get (wind and weather permitting, as the pleasure boats are cautious to inform you when advertising their excursions) a good view of much of the town and see one side of the busy life of a large seaport. Easter Sunday has the highest tide of the month : at the entrance to the Prince of Wales' Dock there will be a depth of 34 ft. 6 ins. Easter Monday morning 1897, the tide serves at 7.15 a.m. Add 22 minutes to this time for each succeeding inflow, and you can time your visits to a nicety to gain the maximum of pleasure, obtainable at little cost, afforded by pure air, rushing, dashing, splashing waves and moving life on sea and land, for this is the time the Pier is most frequented. The primary object of the West Pier is to give direction and depth to the river, and to prevent silting. It is a gigantic wooden framework, filled in with great blocks of sandstone, extending 2,000 ft. into the bay. It is a two-decker, the upper floor forming a fine esplanade, well railed in on both sides, with a few seats. At the seaward end is a tall tapering iron lighthouse showing a fixed red light. The approaches to the Pier are devious and somewhat difficult to a stranger, and at 'tide-time' are obstructed by the opening of dock gates and bridges. The best plan for visitors is to make for the Royal Institution, near the South Dock, and, bearing east by south, cross the Armstrong Swing-bridge, leading direct to the sea front. The West Pier will then be in full view.

Visitors arriving by G.W.R., after a smoky run for the last two or three miles, find themselves in High Street. They will have formed a bad impression of the place, which we must help to remove. Let us take a walk through one of our principal thoroughfares, leading westward. Immediately in front, as we turn from the station into Alexandra Road, stands the Grand Hotel—the head-quarters of the N.U.T. Executive. Some little distance along this comparatively new street, cut through the 'rookeries' of the old town, we find the imposing block of buildings devoted to the purposes of the Free Libraries Acts and the Corporation School of Science and Art. Here the Mayor, Councillor Howel Watkins, intends holding a Reception of the N.U.T. Representatives on Wednesday of Easter week. Passing Holy Trinity Church, with its Bath-stone steeple, we arrive at the Higher Grade Board School and the School Board Offices. A few more steps and we are alongside the 'Albert Halls,' devoted for the time-being to the meetings of the Conference. Fronting the larger Hall is the commencement of Mansel Street, and we pass on under the shade of an avenue of trees, now bursting into the beauty of spring. A gentle ascent brings us to Walter Road, a broad tree-planted, villa-fringed boulevard, ever gently ascending. On our right are the Congregational Church, the Constitution Hill with its new railway operations, which, when completed, will prove an easy means of exploring the streets and terraces on the heights of Town Hill, and of visiting the charming little park of Cwmdonkin, nestling in a natural hollow in the hills, protected from every wind that blows, except the south, and affording a delightful retreat for 'talking age and whispering lovers.' We proceed on our way and pass the Baptist Memorial Church and St. James', the latter standing in its own extensive grounds. One backward glance, when past the church, will repay the little trouble. On right and left may be found square and crescents of quiet, well-built residential houses. We are in the 'West End,' away from the copper smoke and sulphur-laden fumes of furnace and chimney. Now we are in the district of the Uplands and on the high road to Gowerland, and near the pleasant village of Sketty (Ynis Cetti or St. Ketti). As we pass on to that quaintly-built villa—The Gnoll—a charming view bursts upon us. To our left and below us is the park of Brynmill, with its small but picturesque lake ; crowning the opposite slope, which is well studded with brand-new houses, is our best and newest type of Board School, opened last September by Sir G. Kekewich, C.B. To our right is the park and mansion of Singleton Abbey—the residence of Lady Swansea—and the village of Sketty embowered in trees ; that graceful tapering spire of the church is the monumental fane of the Vivian family, and rises above all that is mortal of the late Lord Swansea. In the middle distance, broadside on, are the wooded heights of Clyne with Woodlands Castle, the residence of Graham Vivian, Esq., brother of Lord Swansea. This has been the visiting place of many high and courtly Lords and Dames. From our point of vantage we get a pretty view of the cliffs of Oystermouth and the Mumbles Islands and Lighthouse ; still more distant we see the hills of Devonshire across the silver sea. We will now pass down the avenue in front of us, and walk round the ornamental water. In the south corner of the park is a gate leading into a lane which by a five minutes' walk leads to the sands. A return to town may be made by the broad embankment between the railway and the main road. On the left are the Recreation Grounds, the Swansea Cricket and Football Field, and the Victoria Park—contiguous open spaces of upwards of 30 acres.

To get a clear graphic picture of Swansea and its surroundings as a whole, no point of view can compare with the summit of Town Hill, where we propose to go next. It is easily accessible, and is a climb of only 600 feet. We start from the cross-roads at the School Board Offices, near the Conference Hall. The ascent of Mount Pleasant commences at once. On the right, some little distance up, is the Grammar School, founded by Bishop Gore in 1682. Within the last two years it has been enlarged and improved, and is now known as the Swansea Intermediate and Technical Schools for Boys. It has an improving endowment, depending upon the development of a fine coal-field in the Ogmore Valley. The annual fee is £6, and an extensive scheme of scholarships is being arranged. Under Dr. Turpin it has a promise of a great future, and a time will come, let us hope, when our leading chemists and metallurgists will be 'home-made' instead of 'made in Germany.' Some distance higher, we turn sharply to the left along Stanley Terrace to the Promenade and the fine Home of the Deaf and Dumb, perched like a sentinel watching over the town below. The Promenade gives the best view short of the summit of Town Hill. We retrace our steps to the main ascent, and are soon in full view of 'St. James' Palace'—in homely phrase, 'the workhouse'—built for 600 occupants at a cost of £50,000. Still ascending we take the middle road, opposite St. Jude's iron church, and are soon upon the road that runs along the crest of the hill. Most of the land is occupied by 'Harding's Farm,' but there are several points where an unstinted view is obtained without hindrance. To the north and north-east are heaped up the carboniferous hills of 'Wild Wales,' and the outlook extends far into Brecknockshire, the distant 'Vans' being over thirty miles away.

BRITISH MUSEUM



VIEWS OF SWANSEA.

(1) SOUTH WALES DEAF AND DUMB INSTITUTION; ALBERT HALLS (on right), CONFERENCE OF N.U.T.
(2) SWANSEA, NORTH DOCK, LOOKING SEAWARD. (3) MUMBLES ISLANDS AND LIGHTHOUSE FROM SWANSEA BAY.
(4) COCKLE GIRLS OF GOWER. (5) LANGLAND BAY AND HOTEL.

From among these highlands descends the Tawe, and over the shoulder of yon black mountain, in the smiling valley below, stands Craig-y-nos Castle, the mountain home of Madam Patti-Nicolini, the queen of song, and 'lady bountiful' of Swansea and its valley. Madam, by her local concerts, has enriched the Swansea Hospital and other charitable institutions to the extent of thousands of pounds. Looking nearer home, we mark the line of tin, copper, and steel works following the trend of the river for miles, and the chimneys belching forth mighty volumes of fire and smoke, striking even in the day time, but by night weird in the extreme, and to be pictured on the imagination, perhaps, as the 'lower regions.' Fortunately for Swansea the prevailing winds, which are westerly, carry the highly objectionable fumes in the opposite direction. The eastern height of Kilvey bears not a tree or blade of grass on one of its sides as the smoke will not allow vegetation of any description to thrive. Strange to say, it has an opposite effect on the inhabitants, as they all, with very few exceptions, look hale and bonny, and as a rule live to a good old age. Looking eastward we note the sandy shore of Glamorganshire skirting the bay for fifteen miles, indented by the rivers Neath, Avon, and Ogmore in succession; the smoke indicates the positions of the tow us of Neath, Britonferry, Aberavon, and Porthcawl. To the north-west lie the valleys of the rivers Llwchwr and Llan, and across the broad estuary of the Burry may be seen the tall stacks of the 'tin-plate town'—Llanelly. On the heights above the Llan stands Penllergaer (the place of the high camp), the country mansion of Sir John Talbot Dillwynn Llewelly, Bart., member of Parliament for the county borough of Swansea. Sir John is no purse-proud country gentleman, but a thorough hard worker, having filled, before entering Parliament, every administrative office in county and borough with great and conspicuous success, and to-day he is a popular man with all parties. Taking up a position near the Farmhouse and looking to the south and west, we take in, almost at a glance, a grand picture of land and sea: the shoreward part of the town with the whole eighteen miles sweep of the bay; the woodlands of Singleton and Clyne; the heights of Penmaen—the backbone of Gowerland; bay after bay of the rugged coast-line of Gower, and on an exceptionally clear day may be seen, though dimly, the Worms Head and the mighty cliffs of Lundy, forty miles down channel. The windows and glass-houses of Ilfracombe may often be seen flashing in the western sunlight at its setting.

SINGLETON ABBEY (Lord Swansea's Residence).

Of the public buildings space will permit me to say but little. The General Post Office is situated in the Castle Bailiwick at the top of Temple Street. The façade is a handsome example of the Tudor style. Behind the Post Office are the scanty, though interesting, remains of that feudal fortress—Swansea Castle. Some idea of its former strength and architectural beauty may be gained from a view in the Strand below, and at the back of the castle, and may be reached by a short lane in the immediate vicinity of the Post Office. Opposite the Post Office stands the magnificent pile of buildings of Messrs. Ben Evans & Co.—the 'Welsh Whiteley.' Lower down Wind Street are the commodious homes of local politics—the Conservative and Liberal Clubs, and the massive bronze statue of the late Lord Swansea. At the lower end of the street, in proximity with the river, is situated the Town Hall, a fine piece of Italian architecture, but much too small for the many requirements of the municipality of to-day. In the front enclosure stands the bronze statue of John Henry Vivian, Esq., M.P., on a granite pedestal flanked by two cannon—trophies from Sebastopol. He represented Swansea in six successive Parliaments.

The Royal Institution of South Wales is a really handsome classic structure, standing in a fine piece of open ground between Wind Street and the South Dock. The front entrance is reached by broad stone steps beneath an Ionic portico, the whole façade being of Bath stone. It was built in 1839, when the South Docks were not in existence, the surrounding offices were the residences of the best families, and Swansea was a watering-place of some note; one can thus understand the anomaly of its present position. The interior is well worth a visit, and will, by the courtesy of its Council, be opened to the Conference visitors during Easter week. The general market in Oxford Street is one of the finest public conveniences of its kind in the country. It has, during the past year, been rebuilt, with every up-to-date convenience, by the Corporation, at a cost of £25,000. The enclosure measures 320 feet by 220 feet, and is entirely covered in with glass roofs. Its central division will be devoted to the Publishers' Exhibition, which promises to be the largest on record connected with the N.U.T. Conferences. Specimens of the old Welsh costume—the figured or striped flannel dresses—may still be seen, together with the cockle-shell hat, flannel turnover, and long full apron. The tall sugar-loaf hats are quite a fashion of the past, as far as Swansea is concerned. The photographers, however, keep a few for artistic purposes, but what pretty young lady is there that does not prefer a 'Picture Hat' for all purposes?

Purchasers in the market will gradually become initiated into the methods of buying and selling, and understand that a 'big couple' and a 'little couple' are indefinite quantities, and that a 'long hundred' and a 'short hundred' require a query or two. It is a most interesting place, especially in the poultry and flower seasons. Saturday is the market day. Then friends meet and discuss the topics of the week, and their home joys and sorrows. They return laden with food for the body and for the mind. Two novelties of the market must not be omitted in taking a general survey—the clean wooden pails of fresh cockles cooked ready for eating, and the piles of 'laver bread,' made from a delicate edible seaweed, forming a toothsome morsel with the breakfast bacon. The hardy peasant women of Penclawdd—Gower—dig the mollusc from the sands of the Burry Estuary, a most prolific breeding ground, for the supply seems inexhaustible. Forty or more of these Gowerians, in their picturesque dress, with pail on head and basket on arm, wending their way into the market, is a striking and unique sight. A little lower down Oxford Street is situated the National Higher Grade School, built in 1847. This year 1897 is therefore its Jubilee. Near the market in St. Mary's Square stands the parish church, just now being rebuilt at a cost of £24,000. The nave, by the indomitable perseverance and energy of Canon Smith, is

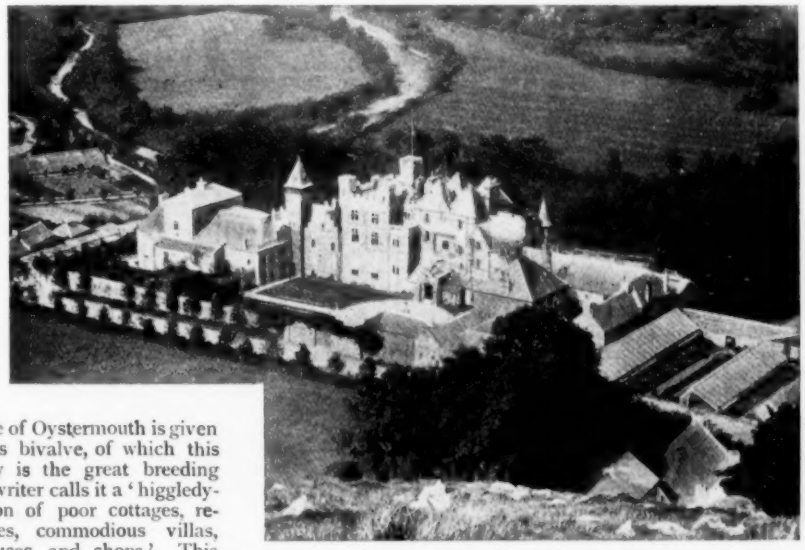
nearing completion, and probably will be ready for the Diamond Jubilee Celebration Day.

The General Hospital in the West End and near the Slip—the best entrance to the sands—is an extensive structure in native sandstone, with high roofs and spires of red tiles. It is a splendid monument to the liberality of the town and district. The movement for its building originated with the late J. D. Llewelyn, Esq., of Penllergaer, who headed the subscription list with £1,000. On its completion it was proposed to erect a statue, in the front grounds, to Mr. Llewelyn, 'in recognition of his unbounded charity and unostentatious acts of philanthropy.' The honour was declined, with the memorable remark that 'public usefulness brought its own reward in the delight it gave in being publicly useful.' Mr. Llewelyn was the father of our present M.P., on whom the mantle of his sire has worthily fallen.

The pleasant run on the top of the fine steam trams to the Mumbles, a distance of five miles, ever in sight of the sea and sandy shore, seems never to pall upon Swansea folk; in fact, to some, life would not be worth living without frequent trips to Bracelet, Langland, and Caswell Bays, with a dip in the briny, a stroll on the cliffs, a lounge in the lovers' nooks, in the sunshine, the shade, or among the heather, and finishing up with an *al fresco* family tea in some quiet sandy cranny. This is the acme of delight to thousands of our young people; and who will grudge them such innocent and healthful enjoyment? The Mumbles itself is a famous fishing and oyster dredging village, with a population of about 4,500. The parochial title of Oystermouth is given from the delicious bivalve, of which this point of the bay is the great breeding ground. A local writer calls it a 'higgledy-piggledy collection of poor cottages, respectable terraces, commodious villas, hotels, public-houses, and shops.' This stigma is, by local enterprise, soon to be remedied; and when the pier and the cliff roads, now both in course of construction, are completed, the already numerous natural attractions will be greatly enhanced. The tram line terminates at present at Southend; the village road from thence follows closely the margin of the bay, and under the cliffs—here over 200 feet high. The fine lifeboat, 'Wolverhampton,' is in its snug house under the lee of yon sheltering cliff, and weekly its hardy crew may be seen preparing themselves for duty's call; the boat thus rigged is a pretty sight. Passing through a defile in the rocks, we obtain a good close view of the islands and lighthouse. On this side the sea is always comparatively quiet. Bracelet Bay, on the other side of the ridge, is quiet now, and will allow bathers running out from the caves to have a dip, but sometimes the sea is wildly grand here, with billows mountains high. On the great black ledge of rocks under the lighthouse, on the 28th January 1883, ran the German barque 'Prince Adelbert.' The crew were in great straits, for a south-west gale was driving the heavy seas over the vessel and the lighthouse. The lifeboat put out to the rescue, but she was stove in, the occupants thrown into the raging waters, and several valuable lives were lost. Miss Jessie Ace, the young daughter of the lighthouse-keeper, was equal to the emergency: catching hold of her sister's hand, and the sister that of the father, she launched out into the deep water, threw out the shawl from her shoulders as a kind of rope, and thus at the critical moment gave just the help needed for the hardy seamen to clamber up the slippery and dangerous rocks during the receding waves. She received handsome recognition and presents at the hands of of the then German Emperor. A special portrait of Jessie and her sister—the 'Welsh Grace Darlings'—was taken by Mr. H. A. Chapman, then Mayor of the borough, and the Queen graciously accepted a copy with an appreciative remark on Jessie's bravery.

At the first Royal Regatta last July, when the A1 class yachts 'Britannia' (Prince of Wales's), 'Ailsa,' 'Satanita,' 'Meteor' (Emperor of Germany's), and 'Caress,' sailed over the 50 miles' course, it was estimated that over 10,000 persons swarmed on these rocks to watch the contest, and many a loyal Welshman heaved a sigh when the 'Ailsa' (Walker, of Liverpool) overhauled the 'Britannia' and carried off the town cup of 100 guineas value.

A mile off the shore is the dangerous sandbank of the Mixen. Listen to the booming of the Mixen bell on the tail of the bank. The channel between is much used by steamers visiting the port of Swansea. In this part last April 20th, at 3 a.m., the Liverpool screw steamer 'Severn' with one blow of its powerful propeller sank the steam tug-boat 'Wasp.' When the tug was raised two of the crew were found dead in the cabin. Where was the third man? The mystery was cleared up nine months after by a letter from Chili, detailing how he, the third man, escaped, and his reasons for clearing off.



CRAIG-Y-NOS CASTLE (Madame Patti's Residence).

One of the most enjoyable trips imaginable to a good walker is 'doing the bays.' From Bracelet (Broadslade) through Limeslade and over the springy turf of the high cliffs and you are in Rotherslade (or slide), a name which indicates the sloping turf-covered land. Here lies the favourite bathing nook for ladies at the one end of Langland Bay. Langland, with its villas, good bathing-ground, but dangerous under-current, equable climate, and fine hotel, is a charming resort. The hotel was once the seaside palace of the Crawshays—the iron kings of Merthyr and Dowlais. Skirting the bay once more we tackle the cliffs, which are here very fine and fantastic in outline, and by degrees drop to the beautiful sands of Caswell Bay. Another climb over Windmill Hill, and Pwlldu Bay is reached. This is the entrance to the far-famed Bishopstone Valley, a bit of the wild and picturesque in Nature, which must be seen to be properly appreciated. The Bishopstone Valley Hotel is situated two miles up, where refreshment of every kind can be had to brace the tourist for a three-mile walk over the moorlands of Bishopstone Common and through the Clyne Woods to the Mumbles Road. At the 'Woodman' Inn the steam tram stops every hour to take up passengers for Swansea, where, with fraternal wishes, I bow and leave you. J.W.C.

A VISIT TO A COAL MINE, with specially prepared illustrations, will appear under 'Visits of Instruction' in our next number.

THE NATIONAL UNION OF TEACHERS.

I.

ELECTION OF VICE-PRESIDENT, 1897.

THAT so much interest is taken and so much vigour displayed in the election of Vice-President must be taken as a healthy sign of Union life and activity. With such a keen competi-

MR. T. CLANCY.

tion for seats on the Executive it is but natural that there should be at least an equally spirited contest for the 'Chair'; and it speaks well for the Union and its future that men are always to be found who are ready to spend and be spent in the service of their fellows. There are two candidates for the honour, Messrs. **Tom Clancy** and **Richard Waddington.**

Mr. Tom Clancy is an Irishman and a Roman Catholic, an eloquent and convincing speaker, a firm believer in the Voluntary School system, a zealous champion in defence of the same, but at the same time a vigorous opponent of abuses and defects, such as bad management, inadequate staff, low salaries, and the one-man manager capricious dismissals. School Board teachers find in him as sturdy a champion as they could possibly desire. In a word, he is a true friend of teachers, whose battles he has fought on many occasions.

A county Tipperary man by birth, he came in early boyhood to England, and served his apprenticeship in St. Boniface Roman Catholic School, Plymouth. Just 20 years ago he was a student in Hammersmith Training College, on leaving which he became head master of St. John's Cathedral School, Portsmouth, where he is to-day. Locally he has taken a very active part in politics, and in his Association has served as secretary, treasurer, and president (three times). In 1891 he was elected to a seat on the Executive of the N.U.T., polling 2,825 votes, beating the coming President of the Union (Mr. C. J. Addiscott) by 217 votes. In the following year he received 5,228 votes; in 1893, 6,516; in 1894, 7,158; in 1895, 7,804; and in 1896, 12,304. His excellent platform style has made him popular all over the country, and during the past two or three years especially he has been in great request north, south, east, and west. On one occasion he was sent to represent the N.U.T. in Ireland, where he was naturally received with open arms.

In the contest with the Southampton School Board he rendered splendid service in defence of Miss Goodwin. For six weeks he spent every night in Southampton speaking at public meetings, and organising the forces in support of Miss Goodwin's candidature for a seat on the School Board. His success on that occasion is now a matter of history. He also fought the battle of the Portsmouth assistants with conspicuous ability and remarkable zeal.

Of late years he has filled the responsible posts of Chairman of the Union's Parliamentary Committee and Chairman of the Parliamentary Election Committee, discharging his duties to the complete satisfaction of his colleagues. In connexion with these duties he has been called upon to spend night after night in the Lobby of the House, pushing with all his well-known vigour the questions of superannuation and the emancipation of the little half-timer. His fine speech in the Queen's Hall, London, on Clause 27 of the late Bill will long be remembered by those who had the privilege of listening to it. Quite recently he has been elected a member of the Departmental Committee on the pupil teacher system, where he is bound to give a good account of himself.

The honour is all the greater because it is the first time a primary school teacher has ever been chosen to sit on a Departmental Committee. Whatever may be his fate in the present V. P. election, all teachers throughout the length and breadth of the land will join in wishing him the best of health, long life and prosperity.

Mr. Richard Waddington is the head master of St. James's National School, Bolton. For thirteen years he has been a member of the Union, and for five years an elected member of the Executive. In the latter capacity he made his first appearance in 1892, when he polled 4,021 votes. In 1893 he received 7,102 votes; in 1894, 8,185; in 1895, 8,178; and in 1896 he was top of the poll with 13,486. He entered the lists as a candidate for the Vice-Presidency in 1896, when he polled 6,138 votes to Mr. Addiscott's 7,202, a remarkably good fight under all the circumstances. Mr. Waddington is a clear and forcible speaker, one who always masters the details of his case before he begins to speak. In debate he is keen, ready to detect the weak points in his opponent's armour, and invariably having 'chapter and verse' to give in support of his contentions. His splendid labours in the 'half-time' field have earned for him a great Union reputation. His paper on 'Child Labour,' which he wrote for the Liverpool Conference, did much to place the true facts of the case before the public. It was he, too, who drew up for the Executive the pamphlet on 'Age and Attendance,' which Mr. Acland himself was glad to use, and to the value of which he publicly testified. A Voluntary School teacher himself, he knows the needs of the teachers in those schools, and he has consistently championed their cause from the first. In his own locality he

MR. R. WADDINGTON.

has filled the offices of secretary, vice-president, and president of his Association, and secretary, treasurer, vice-president, and president of the Half-Time Council of Teachers. As Vice-Chairman of the Education Committee he has done excellent work, winning golden opinions from his colleagues for his thoroughness, zeal and industry. He was a member of the deputations to the Education Department on the questions of 'Needlework,' 'Trained' and so-called 'Un-

trained' teachers, 'School Attendance,' and 'Suitable Occupations' which he characterised as a 'fad run mad.' He was also a member of the deputation to the Science and Art Department on 'Drawing.' In many dismissal cases he

MR. C. J. ADDISCOTT.

has done yeoman service in exposing the system under which such dismissals are possible. Among these we may mention the Deane and Gawber cases, in the former of which, especially, he laboured with great ability and zeal, never slackening his efforts until the teacher concerned obtained a better appointment than the one from which he had been capriciously dismissed.

He has frequently spoken on public platforms, both metropolitan and provincial, and always with complete success. His policy is 'the teacher before the denomination,' and he is, of course, in favour of Superannuation and Reasonable Security of Tenure. He insists on voluntary contributions being a reality, the audit of the accounts of Voluntary Schools by the district auditor, and the abolition of compulsory extraneous tasks. He is as ready with his pen as he is fluent of speech, frequently contributing to the various educational journals. Whether successful or unsuccessful in the present contest, it will be generally admitted that he has deserved well of the profession. All, too, will join in the hope that he may have health and strength to serve the Union for many years to come.

II.

THE NEW PRESIDENT—MR. C. J. ADDISCOTT.

Of Mr. Charles James Addiscott, the President-elect, we have so recently given a rather full account in our series 'Well-known Teachers at Work' (February 1897) that we need here do little more than refer our readers to that article.

III.

THE RETIRING PRESIDENT—MR. T. J. MACNAMARA.

Mr. Macnamara has proved himself a worthy successor of the good men and true who have preceded him in the chair of the Union.

He had already built up for himself a reputation when he was called to London to edit the publications of the Educational Newspaper Company.

In the larger sphere in which he has found himself he has developed in almost extraordinary fashion. Most of our readers are familiar with his N.U.T. work, and by this time the majority of the teachers of the country know him personally. At any rate they have had opportunities of meeting him, for during the past year he has attended—in connection with the N.U.T.—no fewer than 46 gatherings of teachers, managers, etc., in all parts of England and Wales. It is well known how he fought for a seat on the London School Board and was returned at the head of the poll, and later on fought Mr. Darling for the Deptford seat in the House of Commons, making a very respectable fight under all the circumstances. It is not, perhaps, so well known that he will be again a candidate for parliamentary honours when the division for which he has been selected is once more called upon to make choice of men. We are not, we hope, divulging a secret when we say that in at least one of the recent bye elections he was approached with a view to becoming a candidate.

During the past year he has attended to his School Board duties with great devotion, he has fought with all his well known vigour and ability 'the teacher's battle' at the School Board, in the columns of *The Schoolmaster*, which he edits with so much skill, and on many platforms. And with it all he has made his executive duties a matter of prime concern, for he has presided at every meeting of that body since he took the reins in April 1896.

The fears of those who thought he was too pronounced a politician to conduct *The Schoolmaster* to the satisfaction of all parties, or to occupy the chair of the Union, have been shown to be groundless; the expectations of his many friends have been realized to the full.

MR. T. J. MACNAMARA.

[Photo by Montague Atkinson, Brixton.

In a word, Mr. Macnamara has been little short of a brilliant success, and there is no doubt, given health and strength, he has a successful future before him. That at least, in all sincerity, we wish him.

EDUCATION ACROSS THE WELSH MARCHES.

MOST of the thirty-five thousand primary school teachers who have wisely given in their allegiance to the N.U.T. will soon wend their way, in thought or in person, across the Welsh Marches, since gallant little Wales, the hospitable, is again taking upon her shoulders the honourable, yet undoubtedly onerous burden of the entertainment of Conference, the venue being, as all the world knows, Copperopolis, as Swansea would most aptly be called. It will not, therefore, be out of place or inappropriate to say a few words anent the making of the ladder which in the Principality is at least roughly complete, the ladder being, of course, that spoken of by the seer Huxley, the two ends of which are the squalid gutter and the refining university.

1. **Primary Education.**—In this connection but little need be said, the elementary schools of Wales being much the same as those of England, as might be expected from the fact that they are subject to the self-same conditions.

2. **Intermediate Education.**—It is in this particular that Wales presents a phase of educational development absolutely unique so far as concerns this island. For to our Celtic neighbours has been entrusted the proud privilege of showing how middle-class education is to be organised and developed until it becomes equally rational with primary education, and almost as easily accessible to the children of the masses, to the end that intermediate and higher education may cease to be the close preserve of the classes. It was in 1881 that a committee was appointed to report on the condition of intermediate education across the Welsh border, but it was not until 1889 that 'The Intermediate Education (Wales) Act' was passed, whereby the recommendations of this committee might be put into practical form, and the yearning of the people be satisfied. That there was a yearning it is very easy to prove. Thus Mr. Bompas says: '*The Welsh are distinguished by a great love of knowledge. Among the common miners there are many well acquainted with the highest mathematics, and it is quite usual for servants and labourers to compose essays and poems for the various Eisteddfods.*' This referred to twenty-five years ago, so that allowing only a moderate amount of influence to be set down to the credit of the primary school, this thirst for knowledge must have been materially increased. Wales is not a rich country. It is true that various minerals are found 'amongst our ancient mountains,' but this does not alter the fact that, except in a few favoured localities, the conditions of existence are much harder in Wales than in England. This explains a circumstance which at the first blush appears calamitous, but which the irony of fate turned into a positive blessing—viz., the poverty of Wales in the matter of endowments. Roughly speaking, these work out at about three times less per head than in England.

When the Intermediate Education Act, then, came into existence in 1889, it was absolutely necessary that there should be financial help to augment the endowments, and 'broadly speaking, the effect of the Act is to supplement the deficiency due to lack of endowments by providing for aid where necessary, from the rates and from Imperial grants.' As to rate-aid, this can be levied to a maximum of one halfpenny in the pound, and already there is a universal cry that this maximum is totally insufficient. From the Treasury is allowed a grant equivalent to the amount raised by this rate. To show how far these amounts fall short of the real wants and necessities of the case, we quote the following figures from Mr. Acland's very interesting 'Studies in Secondary Education.' 'If it be estimated roughly that schools should be provided for twenty per 1,000 of the population (say twelve boys and eight girls), this would mean, on a population of one and a half million, accommodation for 30,000 children (20,000 in South Wales, and 10,000 in North Wales). If it be further estimated that, at least, an income of £8 per pupil must be provided, of which the parents could not contribute more than one half, this would show that £120,000 a year would be required, besides what was needed for buildings, and *not half of this sum was forthcoming.*' Fortunately help came unexpectedly. Every one will call to mind the suddenness of the passing of the Local Taxation Act in 1890, by which County Councils became responsible for technical instruction. To Wales a yearly sum of £34,000 accrues under this Act, and this amount came as a gift from the gods at this juncture, and probably saved the scheme. We cannot follow step by step the gradual development of this scheme for the provision of secondary education.' Suffice it to say that 'the whole of the sum of £34,000 available under the Local Taxation (Customs and Excise) Act, 1890, is devoted to the purposes of intermediate and technical education.' This, together with a sum of £43,000 utilised under the provisions of the Welsh Intermediate Education Act, 1889, and the Technical Instruction Acts, 1889 and 1891 (by which a rate of 1d. in the £1 may be levied in support of technical education) makes *the total sum annually devoted to intermediate and technical education* £77,000. As a result, we have to-day in every populous area or county of Wales a secondary school established, whereat sound instruction in science, modern languages, classics, and commercial subjects may be obtained at fees fixed at about £4 per annum, with plenty of scholarships for promising pupils of limited means. What a boon such a reform in middle-class education would be to richer England, where, in spite of her threefold richness in endowment, too often the education of the middle-class youth is stunted and aborted at a private adventure school, whose aim is money-making rather than the proper bringing up of the young. At present most of the buildings are temporary, but local subscriptions are readily forthcoming, and half the cost of new buildings is usually provided in this voluntary way.

University Colleges.—Of these institutions, wherein instruction is given up to the standard of the University Degree, there are now three in Wales—viz., the **University College of North Wales at Bangor,** which, opened in 1884, received its Royal Charter in the following year; the University College of South Wales and Monmouth at Cardiff, which was established by Royal Charter in 1884, having a roll of four hundred students; **the University College of Wales at Aberystwith,** which was the first of these colleges to be established, and in connection with which there is now a flourishing Day Training College. The history of the foundation of this college is closely interwoven with the life of the late Sir Hugh Owen, than whom no Welshman is remembered with livelier feelings of gratitude by all good and true sons of the Principality. He gave up his post of Clerk to the Poor Law Board at Somerset House in 1872 to devote himself to the work of bettering the condition of education in the Principality. He was one of the founders of Bangor Training College for Teachers, and also of Aberystwith College, or, as it was then called, the University College of Wales. For many years he was secretary and treasurer to the college. It was chiefly owing to him that the British school system was introduced into Wales, and he helped to establish the Cambrian Association for the Education of the Deaf and Dumb, the Hon. Cymrodorion Society, the National Eisteddfod Association, and the Social Science Section of the National Eisteddfod; for twenty-three years he was a member of the British and Foreign Schools Society. Well then did he deserve the knighthood bestowed upon him by the Queen shortly before his death in 1881, and small wonder is it that his memory is kept green in the 'Land of our Fathers.'

From 1863 to 1872, when Aberystwith College was opened, £12,034 11s. 3d. was collected for this purpose, which amount had swollen to £50,000 in 1880. It remains to be stated that all the schools and colleges above mentioned are entirely unsectarian: members of all religious denominations were amongst the contributors; thirty-three per cent. of the subscriptions were obtained from Churchmen, twenty-nine per cent. from Calvinistic Methodists, twenty-four per cent. from Independents, and the remainder from other communities. The subscribers belonged to all classes, and it deserves to be noted that a large amount was contributed in very small sums by persons in very humble circumstances. Out of this College grew the other two University Colleges, and also the Intermediate Schools which were necessary to prepare students in order that they might be competent to avail themselves to the full of the higher education provided at these miniature universities.

Another admirable feature of Welsh education is the representative and popular character of the governing bodies, upon which sit two teachers elected by the head teachers of public elementary schools 'from their own number.'

The University of Wales.—It was not to be expected that these *de facto* universities would rest content with the lower designation. Accordingly a movement was early on foot to call into existence a real Welsh University recognised by Royal Charter as such. The Charter passed under the Great Seal on November 30th, 1893, since which time the organisation of the University has proceeded apace, and in January, 1896, the first Matriculation examination was held. The constituent colleges of the University are those of Aberystwith, Cardiff, and Bangor, the Senate being composed of the heads of departments of these Colleges. A Government grant of about £3,000 is awarded for expenses, and already the University bids fair to become equally successful in its sphere as the Intermediate and University Colleges in theirs.

As is most right and fitting, the Prince of Wales is the Chancellor of the University which has crowned the work of Sir Hugh Owen and the hundreds of leal Welshmen who not only realised the vital need for thoroughly educating the indwellers of the land of the leek—many of whom perforce, by virtue of the barrenness of the land, must, upon arriving at manhood, to fresh fields and pastures new—but who gave of their substance to bring about the present excellent school and college provision, which is an ornament to gallant little Wales and an example to her bigger and wealthier sister across the Marches.

THE SECOND GORST CODE.

With the howling winds that usher in gusty March comes that hardy annual the New Code, the perusal of which—big as it is with the weal or woe of the teacher, telling as it does of the inception, perpetuation, or removal of hardships and grievances, and of late, thank heaven, of the gradual dominion of commonsense—provides the primary teacher with one of the standing-mild sensations of his year.

This year the term 'new' is almost a misnomer, for the element of novelty, if not altogether conspicuous by its absence, is sufficiently inconsiderable to turn our thoughts in the direction of that millennial code which will be so perfect as to need no revision. But that happy period is not yet, albeit that Sir John Gorst has for the nonce resolved wisely to let well alone until the *status quo* shall have had sufficient time to realise its possibilities. Meanwhile let us turn to the changes, big and little, the former numbering but four, the latter many.

The Irish Certificate to run in England.—Of this somewhat sweeping change there have been during the past six months premonitory rumours. It cannot, therefore, be called a bolt from the blue. Briefly expressed, this innovation, which is contained in the addenda to Arts. 51, 57, and 60, legalises the recognition of an Irish teacher, trained for two years and certificated of the first class, as a certificated teacher in an English school. Untrained teachers of the first and second class, and trained teachers of the second class are to be recognised as assistant teachers, and may, after a year's service, take the second year's papers of the English certificate examination.

It is probable that this potential addition to the ranks of English teachers may mean but little of a real addition, especially as the Irish teacher by coming to England—to gain very little, if any, increase in salary in the case of the women teachers, and a possible £40 or so per annum in the case of the men—will forfeit all claim to a pension which may amount to as much as £90 per annum. Moreover, as Irish teachers are necessarily totally ignorant of the working of English schools, candidates with the Irish certificate will be very heavily handicapped in competing with English men and women.

A Written Agreement.—The addition to Art. 71 affords us a certain amount of satisfaction because of what it is, and very much more when we contemplate what it may become. It reads as follows: 'Any agreement entered into between managers and teachers must be in writing. After the 1st January 1898 the Department may refuse to recognise any teachers not so engaged. A model form of agreement is given in Schedule VI.'

Speaking to a deputation of teachers as to the meaning of 'may,' Mr. Balfour laid down the ruling that *may* means *must*, so that, in the first place, a written agreement is to be a *sine quâ non* in the next year. As to the model form in Schedule VI., one naturally turned to it to see if any prohibition of compulsory extraneous tasks, any security against unjust dismissals might have edged themselves in. As to prohibition, it can be said by way of slight comfort that there is no space left in which such out-of-school duties may be set out, and respecting security, there is this slight note of encouragement: The meeting at which a teacher is to be dismissed is a meeting of which every individual manager must have received notice. This is not much of an advance towards that at which we aim, but it is a crumb of comfort to know that it is at least a turning of the face in this direction. A further wet blanket is provided by the fact that this particular form is not compulsory; but small School Board and Voluntary managers will certainly adopt it *faute de mieux*, so that undue importance need not be given to this point.

Specific Subjects.—Under this head is encountered another of the more pronounced innovations, the infrequency of which was noted at the commencement of this article. At present, the inspector is bound to give notice of one visit at the end of the year in order that he may examine the children who are to be presented for specific subjects. This no longer obtains, and instead of a capitation of 3s. or 2s., according to merit, we have now a 'variable grant of 1s. or 6d., calculated as follows:—All the hours during which any registered scholar has received instruction during the school year in any specific subject in which not less than 40, nor more than 60 hours' instruction has been given during the school year, shall be added together, and a grant of 1s. or 6d. shall be paid for every complete 24 hours.'

This will involve no financial change, and, so far as it does away with payment by results, it is a step in the right direction already chosen with respect to other subjects.

The usual rules as to who may take specifics, and how many may be taken by each scholar, etc., follow. Then comes the undoubted sting of this new departure to be found in the tail, as witness the *ipsissima verba*, 'The attendance in each specific subject shall be separately registered. The register must show clearly the number of hours' instruction received by each scholar in each subject in which he is instructed. No lesson of less than half an hour in length is recognised for purposes of registration. The register must be marked before the beginning of each lesson.'

For this little bit of vexatious filching of time that might more profitably be spent in teaching the specific there is no need, and it is to be hoped that 'My Lords' will accept the sensible proposal of the Executive, that registration shall simply mean counting and recording the number of scholars present at each lesson. In the old days of mistrust of the teacher such a proposal would, mayhap, have been received with wide-open eyes. Now that trust has succeeded mistrust, we opine that there is good hope for the adoption of this time-saving amendment.

A New Specific for Girls.—Experimental science is evidently making headway at Whitehall, and our girls are invited to take their share of this work in a happy combination of the domestic and the laboratorical, as will be seen from the syllabus of the new subject—Domestic Science—which follows:—

1st Stage.—Measurements of weight and size (volume), preferably in the metric system. Measurement of heaviness or density of water, milk, etc.

Floating bodies—the lactometer.

General effects of heat on matter in its three states, with applications to cooking, boiling, ventilation, hot water supply, steaming, freezing, clinical and household thermometers, weight of air, mois-

ture in air, drying and airing clothes, weather forecast, distillation, solution, and solubility; modes of heating the dwelling, transmission of heat, clothing.

2nd Stage.—Effects of heat on food materials such as sugar, cheese, flour, eggs, fat and lean meat. Modes of cooking; yeast, baking powder, a loaf of bread. Effects of heat on mineral matter such as iron, copper, brimstone.

Rusting of iron, and general nature of air.

Burning of a match, candle, lamp, and phosphrous. Oxygen the active part of air. Burning of carbon, coal, or coke in air or oxygen. Fuel and combustion. Coal gas, burners, and gas stoves. The gas meter. Carbonic acid gas, its presence in the atmosphere, its origin.

3rd Stage.—Sources and impurities of water. Water supply and filtration. Hardness of water. Water a product of combustion. Composition of water.

Acids and alkalis, soap, soda, and cleaning.

Ventilation and warming more fully considered.

The alimentary system. Foods, composition and functions. Classes of foods. Decay and disease; disinfectants.

Pupil Teachers, Candidates and Probationers.—A system that needs constant tinkering stands self-confessed as defective—to use no stronger term. This is the case with our illogical Jekyll-and-Hyde pupil teacher system. Last year was styled, not inaptly, the Pupil Teachers' Code, on account of the space and attention devoted therein to those neophytes. This does not prevent a further modification in the 1897 Code. In the first place a candidate cannot be indentured until **fifteen years of age** except in the case of rural schools, where, by the special indulgence of the inspector, fourteen may be substituted for fifteen. To this all will say 'agreed.' Engagements now, be it noted, cannot commence with the school year, **January 1st and July 1st** being the only accepted times under the new code for the commencement of an apprenticeship. In addition, a **pupil teacher may be indentured** for four, three, two years, or **even one year.**

The April and October examinations are now dubbed the **Spring** and **Autumn** examinations respectively, the date of the former being April 10th, and of the latter October 16th, for the present year.

Probationers and Candidates have now a special examination, the syllabus for which is given in Schedule V., consequently the initial examination of the budding teacher will no longer be that of Standards V., VI. or VII. as heretofore. It is further remarkworthy that for each of the three years there is a special reading book prescribed, as follows:—1st year, 'Ivanhoe'; 2nd year, 'The Vicar of Wakefield,' with recitation from Cowper's 'Task,' Book IV., lines 1–363; 3rd year, Macaulay's 'Lord Clive' or from John Bunyan.

Probationers must each year of their probation pass the examination above referred to, whether they have passed on previous occasions or no.

The optional subject is Section I. of the Science and Art Department's Physiography Syllabus, divided into three separate parts for the three several years, and being known in the Code as 'Elementary Science.' As the course embraces the chief fundamental principles of physical science, it is well worthy the attention of those who would strive after a rational education of the embryo educator. We append the syllabus:—

SECTION I.—PHYSIOGRAPHY, SCIENCE AND ART DEPARTMENT'S SYLLABUS.

Candidates for probation.	Simple mechanical laws in their application to common life and industries.
Candidates for engagement as pupil teachers.	Outlines of physiology in its bearing on health and work.
First Year.	Physiography.—Matter.—Forms of matter. Indestructibility of matter. Mass, volume, density, specific gravity, and weight. Centre of gravity.
	Force, Motion, and Inertia.—The parallelogram of forces. Composition and resolution of forces. Conversion of rectilinear into circular motion.
	The Mechanical Powers.—Principles of the lever, the pulley, the inclined plane, and the screw.
	Energy.—Heat, radiation, electricity, and chemical action as forms of energy. Mechanical work.
Second Year.	Physiography.—Heat and temperature.—Discrimination between heat and temperature. Effects of heat. The measurement of temperature by thermometers. Change of state caused by heat, as in ice, water, and steam.
	Radiation.—Rectilinear propagation of radiation. Reflection and refraction of radiation. The analysis of light by a prism, and its recomposition. The colour disc. The visible spectrum.
Third Year.	Physiography.—Chemical composition of matter.—Mixtures and compounds. Water; its composition proved by analysis and synthesis; its physical properties. Elementary properties of oxygen, nitrogen, hydrogen, carbon, iron, and mercury; and of water, carbon-dioxide, lime, silica, and the alkalis, common salt, iron oxide, and mercuric oxide.
	Terrestrial Magnetism.—Properties of the lodestone and artificial magnets. The earth a magnet. Primary laws of magnetic attraction and repulsion. Dip. The earth's magnetic poles.

Having now passed in review the four chief innovations in what we conceive to be the order of their importance, we proceed to deal in numerical order with the remaining alterations.

Modifications in Minor Matters.

Art. 12 (h).—The attendance of children at a Training College or P.T. Centre, for the purpose of affording practice in model lessons to the students, may be counted in the usual way.

Art. 42.—'Pupil teachers whose engagements have been extended (on account of postponement of Scholarship Examination), will not be reckoned as pupil teachers for the purpose of this article,' *i.e.*, a certificated teacher may have three pupil teachers, *exclusive of those* whose engagement has been extended.

Art. 50.—Blind ex-P.T.'s, who pass the Scholarship Examination, are recognised (for service in schools for the blind under this article. A humane recognition, sure to be popular.

Art. 51, Footnote.—The first Public Examination in Arts and the second Public Examination in Letters of the Durham University now qualify candidates for service as assistants under Art. 51.

Art. 56.—Arrangements will be made for the special examination of blind candidates for the Teacher's Certificate.

Art. 60 (b) enumerates other examinations in pedagogy which will be accepted in proof of professional skill, and holding which a graduate of any British University becomes *ipso facto* a certificated teacher. The number of side entrances is thus greatly increased in a way not calculated to reassure those who feel that the Government should exact a real training as a condition of service in a State-aided school.

Art. 60 (c).—The evil day is again postponed as regards the possession of a drawing qualification as a *sine qua non* to the Whitehall certificate. Instead of 1897, we learn that 'no persons who become otherwise qualified after 1900 will be recognised as certificated teachers, unless or until they have passed through a course of instruction in drawing satisfactory to the Department.'

Art. 73 (a).—In last year's Code we read that, after August 30th, 1896, a certificated head teacher would be considered sufficient for only 50 in place of 60 scholars, a certificated assistant teacher for 60 instead of 70, and an ex-P.T. for 45 in place of 50. This is repeated in the present Code, except that September 30th, 1897, is the revised date, a revision not likely to afford satisfaction to the opponents of unwieldy classes.

Art. 82 (a).—Here also the average attendance of the school which might be taught by a provisionally certificated teacher is to be reduced from 60 to 50, not after August 30th, 1896, but after September 30th, 1897.

Art. 82 (c) provides that the grant is payable for three months between the leaving of one teacher and the appointment of another, provided the school is kept open and the registers are

duly marked during the interval. Nothing is said as to the instruction during the interval.

Art. 87.—The fine for closing without intimation to the inspector is *not to exceed* £1, and it is specially remarked that 'This article is not intended to limit the discretion of managers in closing a school temporarily in the event of a sudden emergency.'

Art. 101 (e) 5.—Two suitable occupations must be taken by Standards I., II., and III., when substituting these for the ordinary class subjects.

Art. 101 (g) and (h).—Cookery may be taken for *four* hours in any one day, and Laundry Work may be taken for *eight* hours in one and the same week, of which not more than *four* may be on the same day.

Art. 101 (addition to N. B.).—The attendances made in Cookery, Laundry Work, Dairy Work, or Cottage Gardening may on reasonable grounds be carried over from one year to the next, being of course only counted once.

Art. 101* permits the payment of the grant when children from infected homes are excluded, and when such exclusion materially affects the average attendance.

Art. 107 is provided with an addition which renders it inoperative should the Education Bill become law. This article refers to the 17s. 6d. limit.

Art. 110 recognises Training Colleges for the Blind, and gives them a right to grants equal with ordinary Training Colleges.

Pensions.—As we cannot have superannuation, notwithstanding the many promises that have been made, it is good that a greater number of the 'Old Guard' should receive pensions under the 1851 Minute. This to some extent is done, and so far this is satisfactory.

		£
611	44 pensions of £30 each	1,320
	232 pensions of £25 each	5,800
	335 pensions of £20 each	6,700
		13,820
	Donations or special gratuities (each year)	340
		£14,160

		£
726	52 pensions of £30 each	1,560
	277 pensions of £25 each	6,925
	397 pensions of £20 each	7,940
		16,425
	Donations or special gratuities (each year)	340
		£16,765

The tale of emendation rounds off with modifications of the various schedules, the most important of which we have already referred to. It may be observed that where Elementary Science is taken as a Class Subject, it must now take the form of *Thirty Object Lessons*, illustrating the syllabus. There are some alterations in the building rules, giving a minimum size for a teacher's house, etc., concluding with the statement that special rooms need not be multiplied in the same district, a laboratory, laundry, or workshop doing duty for several schools in the same district.

Instructions to Inspectors.—These are admirable, the inspector being instructed to omit microscopic criticism, and to confine the report to a general estimate, together with specific notice of striking excellence or defect, in which matter common sense is about to triumph.

Record books and syllabuses are made for the school, and not the school for them, is the very necessary dictum laid down for the guidance of those inspectors whose souls crave for these oft-abused aids. But by far the most important addition to the instructions is that which warns against too high classification, especially in the lower standards. Teachers will be wise to make full and careful use of their Standard o, or they may find their organisation criticised as unsatisfactory. Two other points may be commented upon, and then this article must close. In the first place, there is to be no lowering of grant without a previous warning as to a specific defect of a glaring character. The raising of grants may take place at the inspector's discretion. Secondly, those who have the instruction of pupil teachers, bearing in mind the arithmetic that was set in October last, will do well to note that **'greater attention should be given to questions demanding the exercise of intelligence and ingenuity,'** which seems as though October intended to repeat itself in spite of the loud complaints of the victims.

In conclusion, we would bear our testimony to the sagacious change that has come over the spirit of code-makers, who may now truthfully say with Othello:

> 'I have done the state some service, and they know it.'

Teachers know it, and will be neither ungrateful nor unmindful.

THE SCOTCH CODE FOR 1897.

IT would be wrong to say that there are no important changes in this year's code for Scotland, since every italicised word in Appendix No. 1 has a meaning and an importance for somebody: yet there is a total absence of those unpleasantly dramatic disclosures that this fateful pamphlet sometimes brings.

There are few changes and all slight, which is so far good, and all in the right direction, which is better. Certain changes are made in the interests of common sense convenience. Under Article 19 A (5), for example, it is no longer necessary to get anybody's permission to make any profession that is included under one of the schemes suggested in the note to the Fifth Schedule; while even if an original profession is made, it need go no farther than the inspector for approval.

But nearly all the italics are used up over the complicated cases of pupil teachers, Queen's scholars, and Queen's students. The picturesque ways in which one can now become qualified to teach in a state-aided school naturally lend themselves to bye-laws and by-bye-laws. The plain pupil teacher is left undisturbed: his teaching power remains standing at 25 pupils. But graduates have received a step up. It is true that they still remain equal to only two pupil teachers, but they are now freed from the humiliating company of mere 'persons over 18 years of age who have passed examinations recognised by the Department.' Those persons have been taken down from Article 79 (*b*) to Article 79 (*c*). As we note this we are apt to think of Tweedledum and Tweedledee till we remember Article 32 (*c*) 2, which tells us that the 'persons' have now lost a fifth part of their teaching power, and are now only reckoned as fit to deal with 40 pupils as compared with the graduates' 50. The 'persons,' however, get nearly a year's warning of their fall, since by Article 141 the change will not take effect till 1st January 1898—time enough for many of the 'persons' to acquire other qualifications.

Article 32 (*c*) 3 introduces us to a still more anomalous being than the 'persons' of Article 79 (*c*). This is the 'woman' who, under a distressing accumulation of conditions, may be accepted as the proud equivalent of a pupil teacher. We have often pondered over this woman, and had come to the conclusion that she was the Master's wife who, to make up for the niggardliness of some remote School Board, spent her days in trying to satisfy a fair proportion of the conditions of Article 32 (*c*) 3. This theory has received a rude blow from the 1897 addition, 'Not more than one woman qualified under this section can be recognised in each school.'

What a tale of rural School Board parsimony is told by the mere fact that such an addition has been found necessary! Yet the other side of the question must not be neglected. Many remote School Boards are sorely troubled, in these days of limited teaching supply, to get anyone at all for the work. This the Department is fully alive to, as is shown by the changes in Article 60, which increase the teaching power of certain candidates for the sole charge of small country schools. The *ipso facto* cancelling of those temporary certificates when

the candidate attains the age of 25 is an excellent provision to insure at least an attempt to gain higher qualifications.

Most teachers will be ashamed to note the insertion of the two words *once only* in Article 29. The need for them is a clear intimation that the advertising teacher has been plying his shameless trade and swelling his number of merit certificates by presenting the same pupils time after time.

Under Article 70 (*b*) we find an increase in the demands made from pupil teachers who seek to present leaving certificates as exempting from the inspector's examination. Such pupil teachers must now have a certificate in needlework. On the other hand, the demand for the Leaving Certificate in Mathematics has now been commuted to a Higher Arithmetic for boys and a Lower for girls. This concession, according to Article 70 (*d*) 6, extends to candidates for Queen's Scholarships and Studentships, but (probably by an oversight) the remark about Higher Arithmetic does not appear in Articles 95 and 96. Indeed, the only changes in Articles 95 and 96 consist in extending the wording of the former Article, and in adding to both the important words, 'and in the case of girls of needlework.' This addition has no connection with the recommendation of Mr. Andrew in the recent Blue Book, that girls in Ex-VI. who are mainly taken up with secondary work, should be relieved from most of the present sewing requirements. It rather aims at the new class of candidates for the pupil-teachership that recent regulations are likely to encourage. Candidates who come from Secondary Schools are usually much better up in the literary subjects than are the pupil teachers trained in the old-fashioned way, but the case is usually reversed in the matter of sewing, and the new regulation seems meant to secure that this important subject shall not be neglected. The Mistress in a school must not only know how to sew, she must be able to teach sewing in the newer collective method if she is to hold her own. The question arises: Who is to give this 'satisfactory report in needlework' that Candidates under Articles 95 (*a*) and 96 (*b*) must now obtain? The natural inference from the context is that the ordinary H.M. Inspector is to be the certificate-giver. Is it not time that this farce of sewing examination were ended? Students in training are assumed to know the elements of needlework before entering college, and certain advanced ladies wish this subject removed entirely from the College Curriculum, particularly in the case of Queen's students. The Department by the addition under discussion shows that it does not share this view of the comparative insignificance of sewing. The only way to prevent sewing bulking too largely in the College Curriculum (which it certainly seems to do at present) is to ensure that candidates shall come up to College better prepared than they do. This can only be accomplished by making the pupil teacher's test of sewing as serious a matter as the subsequent test in College. The examination in this subject among the English pupil teachers is something for our Department to copy.

Coming to the Third Schedule there is really nothing at all new, since the italicised additions are only the replacing of certain requirements that seem to have been inadvertently omitted from last year's Code.

The changes in the Fourth Schedule, Subject 6 (Boys), are doubtless important to those whom they concern, but they are not of general interest. The same remark applies to the rescinded order in Appendix 2, and to the impressive minute which in Appendix 3 regulates the educational machinery of certain parishes in the counties of Ross and Inverness.

Speaking generally, so far as the Code has been changed, it has been improved.

ENTIRELY NEW OBJECT LESSON SUPPLEMENTS, BEAUTIFULLY PRINTED IN COLOURS, will be presented with many of our issues during 1897. Will our Readers kindly make this known to their professional friends?

MODERN EDUCATIONAL REFORMERS.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),

Author of 'Mental Science and Logic for Teachers.' Late Director of the Birkbeck Training Classes and Lecturer therein on School Method.

XXVI.—T. G. ROOPER, H.M.I.S.

LOOKING through a recent number of an American school journal, we happed upon a closely printed two-page list of books, mostly on the art, science, and history of education. Somewhat quaintly, but none the less appropriately, this copious list of tomes was described as the Teachers' Tool-chest, and, by way of further insistence upon the indispensability of these tools, we read that 'not to know them argues yourself unknown as a teacher.' For the thoughtful teacher chafing under the empirical rule-of-thumb dicta that constitute *his* provision in the tool department, there is much in this list to impel him to 'chew the cud of sweet and bitter fancy;' for on the one hand, to the really earnest teacher, bent upon obtaining a respectable knowledge of his cult, such a library opens out wide possibilities, whilst on the other hand he is apt to bitterly deplore that English publishers should not cater for English teachers in the same liberal fashion as is done in the land of our cousins. Who is responsible for this blameworthy omission? Let us look into this plaint. What do 'My Lords' think about the art, theory, and history of education as an organic part of a teacher's equipment? For answer look to the training college syllabus and you are fain to confess that the powers that be do not set a high value upon this kind of lore, judging from the slender requirements under this head. What about the Universities? Do they encourage the young teacher to acquaint himself with what has been done in the practice of psychology and ethics as bearing upon the education of children? Will they dub him bachelor, master, or doctor, should he attain to eminence in this most necessary branch of knowledge and practice? By no means. If he is learned in that which appertains to ministering to a body diseased, Senatus Academicus will inscribe his name amongst the honoured ones; but let the student be bent upon ministering to the mind diseased, or, better still, let his aim be the right fashioning of the mind and the prevention of mental disease, and with but few honourable exceptions, 'bountiful mothers' scorn his labours and withhold their approbation. Let us not wonder then at the meagre contents of our teachers' tool-chests, let us cease to express surprise that inspectors, teachers, and school authorities and controllers have but a lofty disdain for the Arnolds, the Quicks, and the Thrings who have desired to perfect pedagogy and pedagogics, with results the reverse of gratifying to themselves and their little band of disciples. Where there is no demand the supply must be limited, wherefore books on the lines of those which should be found in our tool-chests too surely spell ruin for the cautious publisher to speculate on this kind of publication. '"Tis true, 'tis pity, and pity 'tis 'tis true.'

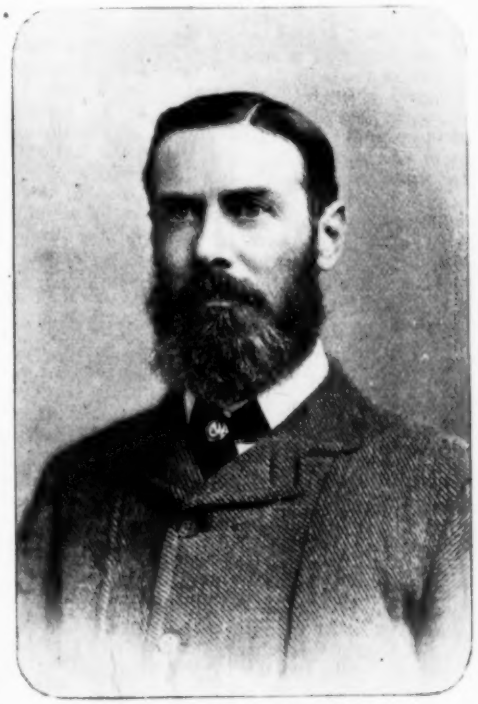
Turning our backs on this dismal prospect, it is indeed a pleasing experience to find men, in spite of discouragement, devoting themselves to this 'proper study' of the teacher part of mankind. Such an enthusiast we are concerned with in our sketch—a prophet, we thankfully add, not without honour even in this his own country. That he is honoured in countries other than his own is evidenced by this selfsame Tool-chest to which we have so frequently referred. Amongst classics as the 'Science of Education' in the list in question we find thirty volumes, third amongst which is placed 'Rooper's Apperception, or, A Pot of Green Feathers,' aptly and truthfully described as 'a popular presentation of Herbartian principles.' This *brochure* is referred to by Quick as 'a pamphlet from which I formed a very high estimate of the writer's ability to give us some first-rate books about teaching. I mean "A Pot of Green Feathers," by T. G. Rooper.' The sweet reasonableness and fitness of this thing is very apparent when we reflect that Mr. Rooper is one of Her Majesty's

Inspectors of Schools. We venture to assert that the just dissatisfaction of teachers with the appointment of non-teachers to the Inspectorate would lose its point were there more Roopers amongst Her Majesty's Inspectors of Schools. But in this matter Mr. Rooper is but as a voice crying in the wilderness. He is one of the very small band of exceptions who prove but too true the rule that school inspectors in England have no part or lot in bringing about the betterment which will express itself in a universal demand for a well-filled teachers' tool-chest.

Mr. Rooper was born at Abbott's Ripton Rectory, in the year 1847. In connection with his early life are one or two circumstances which, looked at from the point of view of his present position and bent of mind, will bear out the old saw that 'what is learned in the cradle lasts till the grave.'

In the first place, both his grandfather and his father paid much attention to the education of the children of the village.

Secondly, he, at the age of nine years, went to a private school at Stevenage, in Hertfordshire, taught by the Rev. J. O. Seager, who, besides being a good scholar, took much trouble to encourage in his pupils a taste for natural history.



T. G. ROOPER, H.M.I.S.

In the third place, after passing through Harrow School, where Mr. Rooper came under the influence of Dr. Butler, he went to Balliol College, Oxford, where his studies were chiefly directed by the late Professor Thomas Hill Green, who in 1864 served as Assistant Commissioner under the Schools Inquiry Commission and contributed a valuable report on the schools of Staffordshire and Warwickshire — who, himself a profound and devoted student of the philosophy of Hegel, may be said to have founded the Hegelian school at Oxford—who took the leading part in the foundation of the Oxford High School for Boys, and who never tired in his efforts to break down the ancient barriers between the University and the City. Reading between the above lines, we shall not be surprised that Mr. Rooper was impelled towards teaching when, after leaving Oxford in 1870, it became necessary for him to choose a profession. But before actually starting upon his chosen career the author of 'A Pot of Green Feathers' went for a time to the land where pedagogy flourishes like a green bay tree—viz., to Germany.

In 1878 Mr. Rooper's career as a teacher came to an end, and his work as one of Her Majesty's Inspectors began, at first in Northumberland, where he spent five years, at the end of which he was transferred to the Bradford district, where for thirteen years he laboured for the good of education. How successfully this labour was achieved, and how well Mr. Rooper played that most important yet oftenest neglected part of the inspector's role—to wit, that of guide, philosopher, and friend to the teachers in his district—may readily be learnt from any teacher who was fortunate enough to listen to and profit from the many truly luminous and thought-provoking addresses that the Bradford inspector from time to time delivered to the assembled teachers. In this propaganda—for it cannot be otherwise described than as the preaching of new doctrines—Mr. Rooper was ably seconded by his professional colleagues, so that when, after thirteen years' work in the West Riding District, Mr. Rooper was transferred to Southampton, great was the regret of Bradford and no less was the gain of Hampshire.

But the regret of the Bradford teachers has been to some extent at least diminished by the appearance of 'School and Home Life,'* wherein Mr. Rooper sets out his thoughts and suggestions, so that now they have a permanent reminder of the teacher whose doings and sayings were so appreciated, and who being absent yet speaks not less eloquently nor less wisely because by the written instead of the oral word. We also, not of Bradford, may benefit from the teachings of this student of pedagogues and pedagogy, nor does it take long to discover that Quick's prescience has been more than justified in this excellent book on teaching. We recommend every teacher who honours us by a perusal of this article, to add 'School and Home Life' to his tool-chest, and we proceed to examine, of necessity but superficially, some of the good things that Mr. Rooper has provided for the delectation of his readers.

Thring of Uppingham—than whom no more sagacious schoolman has existed from the days of Socrates down to Herbert Spencer—never tired of thundering out in characteristically impulsive way 'Education is not cram but character.' No worthier battle-cry for the educational reformer could possibly be conceived, and accordingly we find Mr. Rooper opening his campaign by discussing that prime need which must be most acutely felt by every earnest teacher—viz., the need for the earnest inculcation of reverence. To make clear what he means by this, he cites the well-known illustration of Goethe, who tells us of 'a few children who are being educated upon an unusual system. Sometimes they stand, having their arms crossed on their breasts, and looking up to heaven with gladness; sometimes they turn their eyes to earth, smiling and keeping their hands crossed behind their backs as if tied there; while in a third kind freely they run together, stand side by side, and look straight before them.' In this way are they taught reverence. 'To begin with, the young child crosses his arms on his breast and casts a joyous look heavenwards. That action indicates reverence for what is above him. Next the children learn to cross their hands behind their backs, as if bound, and incline their faces earthwards. This action indicates reverence for earth, and reminds them of two things: firstly, the earth is the source of life and happiness; and, secondly, that it is also the source of infinite misery, for from the earth arise pain and sorrow . . . . . In these two stages of our training the children are taught to stand alone and apart; but in the third stage they join each other side by side, as comrades, and, thus united, look straight before them, facing the world with a bold front. Until man has learnt to associate with other men for a common purpose, there prevails between him and his fellows nothing but suspicion and mistrust.' This thinly-veiled parable is made the text upon which is delivered a stirring appeal to teachers, who are exhorted to teach first, foremost, and always *patriotism*, *civic life*, *beauty*, and the *Christian life;* nor are signs wanting to indicate the flow of public opinion in this greatly to be desiderated direction.

'Bad Bringing Up' is the subject of Chapter II., which leads to Chapter III., 'A Pot of Green Feathers,' the charm of which can scarcely be overrated. A pupil-teacher is giving a lesson

* 'School and Home Life,' by T. G. Rooper, M.A., H.M.I.S. Hull: Brown & Son.

with a pot of ferns, and, whilst exhibiting the object to the gaze of the children, asks if any child can say what it is that she holds before them. The only response to this question comes from a little girl, who says 'A pot of green feathers'! The teacher apologises for the poor little girl, who 'knows no better'; but the inspector falls a-thinking on this answer, and is at length enabled to present to the world of parents and teachers as neat a little treatise on the what and how of perception as can be desired, wherein is set out how far the senses are the gateways of knowledge, to what extent old knowledge may condition new, and how the mind is affected whilst this assimilation of the new with the old is taking place. Happily expressed and truthfully conceived, as this little gem of pedagogic lore undoubtedly is, it is small wonder that here and on the other side of the Atlantic it has been received as a masterpiece *in petto*. In these days of compulsory object-teaching the wise words of a master should be eagerly perused. Such words are to be found in Chapter III. At the outset the difference between object-teaching and language or information lessons is made clear, and the reader is led to the just conclusion that '*the main business of the object-teacher is to enable the learner to form correct impressions, and there is no more important branch of instruction.*' After a discussion of the formation of the general notion starting from the perception of the individual, comes the truthful declaration that 'good object-teaching leads to (1) *accurate perception*, (2) *accurate description*, for which we must (a) divide the object into parts and (b) re-unite the parts into the whole. *To furnish the child with a method of acquiring knowledge for himself*—this is the aim of object-teaching, according to Mr. Rooper, and, we venture to add, according also to common sense. Thus the wise teacher will attach more importance to the act of observation than to the amount of knowledge to be got from his lessons, and, lest the reader may say 'Impossible,' Mr. Rooper gives several outline lessons, to which we cannot do more than draw attention.

Drawing in infant schools is next dealt with, the most important part of the chapter being that which cries down the practice of permitting children to draw objects in distorted perspective, Mr. Rooper rightly claiming that an obstructive association, difficult to remove later on, is inevitably set up. The difficulties of object drawing, especially in respect to 'foreshortening,' receive adequate treatment, the advice given being to encounter the difficulty boldly from the onset by setting even little children to draw from objects. Some curious errors, arising from the inherent difficulty of expressing the three dimensions of objects within the two dimensions of the paper, are interesting reading, and will encourage teachers of model drawing to persevere in their efforts and not to expect too great progress in this direction. The cardinal defect of drawing, viz. mal-observation, comes under special notice, and the teacher will agree with Mr. Rooper that 'the aim of the teacher should be to help the scholar to use his eyes to a better purpose.'

The two next sections cannot fail to charm, as they vividly afford information as to the practices and penances of our German and French *confrères*, and this, too, from the mouths of themselves. Tribute is paid to the work of Matthew Arnold, and to Messrs. Wild and Davis in this connection, and then we see the German teacher as pictured by his inspector, as painted by himself, and as portrayed by friends and foes in the press and in parliament, the perusal of which is bound to result in mixed feelings of alternate commiseration and envy. In dealing with France Mr. Rooper very deftly dovetails an account of what he saw at the French Exhibition into a comprehensive survey of French education, which again is interesting and instructive to a degree. Next in order comes a dissertation on the 'organisation of education,' upon which peg Mr. Rooper hangs some pregnant remarks, the sum and substance of which may, perhaps, be expressed as follows: (1) a study of medieval schools shows that all modern reforms were more or less nebulously foreshadowed; (2) that it is fatal to the weal of a school for it to be disconnected and isolated from those above it and those below it, which points a moral not fully appreciated even at the end of the nineteenth century.

'Lyonesse' is a charming section of a quasi-biographical nature, setting out strongly the loyalty that Mr. Rooper feels towards his *alma mater*, and discussing '*Home* versus *Education at a Public School*.' That, in ninety cases out of a hundred, the really good public school trains a boy more effectually than can be done at home, has been accepted since the days of Tom Brown and his master, Dr. Arnold, which view of the case is upheld by Mr. Rooper, with whom, however, we cannot agree as to the wisdom of fagging. We pass over several chapters, not willingly but simply because space forbids a more lengthy examination of Mr. Rooper's opinions. In discussing the modern training of girls, Mr. Rooper is all in favour of an increasingly liberal education, both mental and physical. Like Mr. Goldbury in Gilbert's *Utopia*, our reformer hails with delight the change that has come over the physical training of an English girl, rejoicing that

> 'She golfs, she punts, she rows, she swims—
> She plays, she sings, she dances too,'

and it is evident that Mr. Goldbury's ecstatic description finds echo in the desires of Mr. Rooper—

> 'A wonderful joy our eyes to bless,
> In her magnificent comeliness,
> Is an English girl of eleven stone two,
> And five foot ten in her dancing shoe.'

One of the most thoughtful sections in the whole book is that dealing with the 'Methods of teaching children between seven and nine years of age.' Every teacher of experience admits the great difference between the infant school training of a child and that which he receives in the lower standards of the upper school. Mr. Rooper is but fair when he adds to his expression of this truth words which exonerate teachers from the blame attaching to this defect: 'I do not blame the teachers for the meagre education which was long given in the lower standards, for under the system by which the Government contracted to pay a fixed sum of money for every child that the teachers could raise to a certain minimum standard of efficiency, it was impossible for them to attempt a varied programme of studies.' He goes on to add that we have changed all that now, and in so doing he but voices the flattering tale ever told by Hope. The evil that systems do, as well as that done by men, lives after them, and the time is not yet when inspectors will allow, or teachers use, that fulness of liberty which will enable them to avoid 'the hammer, hammer, hammer on the hard high road of the three R's.' But for the curriculum so ably mapped out by Mr. Rooper for the children from seven to nine, we have nothing but the highest praise. For this alone the book is worthy of profound study, and we heartily commend it to the earnest attention of those whose aim it is to be the wisest and best amongst their fellows. How liberal is Mr. Rooper's interpretation of our duty to the youngest of Young England may be gathered partly from what follows:—'No school should be without its aquarium or its vivarium, and the class may be relied upon to bring, when required, cats or rabbits or doves to illustrate special lessons.' The only other chapter that can be noticed in this short and necessarily imperfect account of the reforms advocated by our author is that on 'Handwork in Education.'

That handwork is an absolute necessity, not only for *muscle* but for *mind*, is a conclusion to which one is very forcibly impelled after reading Mr. Rooper's digest of Dr. J. Crichton Browne's evidence in this direction; moreover, this exercise is necessary more especially between the ages of *four* and *fourteen*. In its earlier stages it may consist of cardboard work and modelling in clay, but the almost impassioned plea for Sloyd with which 'School and Home Life' concludes leaves little doubt as to the form that handwork would take had Mr. Rooper the 'wishing-cap.' The effect of handwork is physical, mental and moral, is the further contention of our author, who further claims that it should constitute a part of the ordinary school work to be performed in the ordinary school hours. Any attempt to teach a trade is severely and categorically condemned as shortsighted and uneducational, whereas handwork should aim at developing into a complementary and supplementary part of the great educational purpose observed by a rightly organised and conducted school. Mere joint-making, as practised in so many schools, produces dexterity, but is barren of discipline—a hard saying,

likely to cause much heart-searching amongst the many ardent advocates of this form of handwork, which commends itself to South Kensington and to many zealots equally enthusiastic with Mr. Rooper in developing manual exercises.

For a more complete exposition of the views of Mr. Rooper, we must refer our readers to the book to which we are indebted for the information upon which is based this article. Within the four hundred and eighty pages of this work are many kernel sayings which we have omitted with regret, and many topics—such as Evening Schools and Art in Schools—that we have reluctantly passed over. We hope, nevertheless, that we have said enough to demonstrate how ardently and how intelligently this new addition to the Reformers' Corner has worked to further the good cause of educational reform, and how well he has won his spurs, which no one, we are convinced, will more worthily wear.

A TEACHER'S VISIT TO GREECE.

I.

'YESTERDAY was the most memorable and critical day in the history of modern Greece'—these were the words of a London daily less than a week ago. And the crisis still continues, and all eyes are still turned towards the little country, watching with admiration the gallant attempts it is making to free the people of Crete from their abominable oppressors, the Turks. Two-thirds of the sufferers are Greeks, who for more than two centuries have been held as tightly under the heel of the tyrant as the Greeks of the mainland were for three centuries. About the year 1825 the state of things for the latter became so intolerable that nothing less than annihilation seemed intended. And all Europe looked on then, as now, but did little more till our own poet Byron shamed England, at least, out of further inaction, and a blow was struck and Greece was free. Had Crete been included in that emancipation, the last seventy years of its sufferings would have been avoided, and the land with the biggest navy in the world would have had the appropriate honour of saving that little classic island, whose king Minos, in the far-off depths of the past, created the first navy the world had seen. Perhaps that honour may yet be ours. However, the purpose of this paper is not politics, but merely to describe a delightful holiday which the writer, set free from school, was enabled to spend in Greece. From the present moment backwards to the dawn of history, the land of the Hellenes has had a fascination all its own. And why? Doubtless because from it germinated all our ideas of science and of art. The learning of the Egyptian, had it found any other *via media*, would scarcely have suited our national genius as it has done. We are what we are because Greece was what it was. Philosophy has often wondered why the greatness of its men was in such remarkable inverse proportion to the smallness of its area, and philosophy will continue to wonder till psychology arrives at perfection, some day, to solve this riddle, but the secret will not be ours. The attraction of mystery will for us ever fasten to the country which gave Homer and Sappho to the world of song, and Plato and Aristotle to the world of thought. The last two are said to divide every successive generation of men between them. No wonder we all wish to tread where their feet have trod, and to walk under skies which covered them, and to climb the hills which stand to day as seen by them. And fortunately, even to limited purses, this is now possible. You can start from the Holborn Viaduct, that very distinctly western spot of our modern western world, and you can end your return journey there, but in the meanwhile you will have felt yourself to have lived through the most wonderful ages the world has seen, and amongst its most wonderful men.

When your outward journey has commenced you are in a hurry to be at the end of it, and so you hasten on from Ostend, which seems almost next door to London, to Brussels—and if the King of the Belgians is not in the same train, make a note of it: he seems for ever on the wing between his Ostend villa and his metropolitan palace. After one night in the dog-disturbed little capital, you make for Bâle, then for Milan, after which nothing but beauty awaits you. Hour after hour the train runs on, bounded on the right by the Apennines, and on the left by the Adriatic; the mists of the mountains, more beautiful than any artist's copy of them, the sapphire sea, the long lines of orange, of lemon, and of olive trees, succeed each other without a break till night draws on and shuts them from the view, and leaves one wondering whether the day has been only a dream and this the reality. Arrived at Brindisi near midnight and pacing its electric lighted streets, accompanied by the little urchins who have awaited the train hoping for chance coppers, the traveller feels tired enough to welcome the little boat which lies ready to convey him to the steamer beyond. This will be his home for the next thirty hours and more, and he does well to forget the engines and go to sleep till daybreak; a hiatus between the beauty of yesterday and that of the coming morrow, which enhances each. Early on deck, with the help of a guide-book we find it pleasant work to identify the classic spots which the boat passes, till by-and-bye, picturesque, white, and ancient, Corfu comes into sight. Up crowd the little boats to take off the passengers to the island. And what a tremendous chattering the dark-eyed boatmen make, and how bright is the red fez they wear; each man wants to crowd his own boat to the exclusion of the others, and is ready to take by force the bewildered passenger. Of the writer's party, one seemed in danger of leaving some of his limbs in more than one boat, and we were quite relieved to find him whole when we reached the land. And here fresh surprises awaited us—the characters of the Greek language were not unfamiliar in time-honoured classics or in the Greek Testament, but to see them in the name of a proprietor over a little shop on this side of a street, and over there on a big poster advertising the virtues of somebody's pill, was just a trifle like playing with dignity. We entered the bazaar, and saw things that made us feel a long way from home, and then in a carriage we drove to that romantic spot where Ulysses first saw Nausicaa in those primitive days when a princess did the family washing by the side of the sea. The road to this was bordered by *cacti* more than ten feet high, and yet withal there was a certain something everywhere that bespoke the British occupation of the place previous to the cession of the Ionian Isles to Greece in 1864. Nor did we fail to remember that Mr. Gladstone, with reference to that event, had come here in 1858. But time was short, and the captain was expecting us back, and so once more we glided over the sunlit waves to find an accession to our numbers on board. There stood Greek priests wearing brimless hats whilst the sun was pouring down upon them; we asked the reason, and were told this was an enforcement of the Turk during his hated rule. Shade being essential to the health of the eye, the shade was forbidden. It seems curious this hat should continue in use so long after freedom has been obtained, and would be incomprehensible had we not learned much nearer home how strong a thing is habit. And there crouched on the deck were a number of Albanian shepherds, with hooded coats of fleece, and skirts like ballet girls' containing from twelve to thirty yards of white calico pleated into a band. They were amusing themselves by a game of chance, and when night stopped the play, they huddled together and slept soundly under the star-lit sky.

Early next morning the stopping of the engines told us we were at Patras, and soon we stepped ashore to find currants here, currants there, and currants everywhere. The houses were white, the dust was white, and the oxen who drew the vehicles through the streets were white. We seemed now to be in the East, and were not surprised to learn that the natives spoke of the party as people 'from Europe' and regarded themselves as Orientals. We went outside the town, and from a hill-side watched women, dressed much as their very great-grandmothers of Homer's time might have dressed, tending the currant vines. The men, also, beside these women in veil and tunic, were in old-time garb; the poorer people everywhere are the last to relinquish national characteristics; and the ploughs these men were driving differed only slightly from those in use when the siege of Troy was making history. In this town of currants, this very busy port, there seems to be a contest going on between the old, old past and the customs of to-day, but we think to-day will be the victor. As

with a pot of ferns, and, whilst exhibiting the object to the gaze of the children, asks if any child can say what it is that she holds before them. The only response to this question comes from a little girl, who says 'A pot of green feathers'! The teacher apologises for the poor little girl, who 'knows no better'; but the inspector falls a-thinking on this answer, and is at length enabled to present to the world of parents and teachers as neat a little treatise on the what and how of perception as can be desired, wherein is set out how far the senses are the gateways of knowledge, to what extent old knowledge may condition new, and how the mind is affected whilst this assimilation of the new with the old is taking place. Happily expressed and truthfully conceived, as this little gem of pedagogic lore undoubtedly is, it is small wonder that here and on the other side of the Atlantic it has been received as a masterpiece *in petto*. In these days of compulsory object-teaching the wise words of a master should be eagerly perused. Such words are to be found in Chapter III. At the outset the difference between object-teaching and language or information lessons is made clear, and the reader is led to the just conclusion that '*the main business of the object-teacher is to enable the learner to form correct impressions, and there is no more important branch of instruction.*' After a discussion of the formation of the general notion starting from the perception of the individual, comes the truthful declaration that 'good object-teaching leads to (1) *accurate perception*, (2) *accurate description*, for which we must (a) divide the object into parts and (b) re-unite the parts into the whole. *To furnish the child with a method of acquiring knowledge for himself*—this is the aim of object-teaching, according to Mr. Rooper, and, we venture to add, according also to common sense. Thus the wise teacher will attach more importance to the act of observation than to the amount of knowledge to be got from his lessons, and, lest the reader may say 'Impossible,' Mr. Rooper gives several outline lessons, to which we cannot do more than draw attention.

Drawing in infant schools is next dealt with, the most important part of the chapter being that which cries down the practice of permitting children to draw objects in distorted perspective, Mr. Rooper rightly claiming that an obstructive association, difficult to remove later on, is inevitably set up. The difficulties of object drawing, especially in respect to 'foreshortening,' receive adequate treatment, the advice given being to encounter the difficulty boldly from the onset by setting even little children to draw from objects. Some curious errors, arising from the inherent difficulty of expressing the three dimensions of objects within the two dimensions of the paper, are interesting reading, and will encourage teachers of model drawing to persevere in their efforts and not to expect too great progress in this direction. The cardinal defect of drawing, viz. mal-observation, comes under special notice, and the teacher will agree with Mr. Rooper that 'the aim of the teacher should be to help the scholar to use his eyes to a better purpose.'

The two next sections cannot fail to charm, as they vividly afford information as to the practices and penances of our German and French *confrères*, and this, too, from the mouths of themselves. Tribute is paid to the work of Matthew Arnold, and to Messrs. Wild and Davis in this connection, and then we see the German teacher as pictured by his inspector, as painted by himself, and as portrayed by friends and foes in the press and in parliament, the perusal of which is bound to result in mixed feelings of alternate commiseration and envy. In dealing with France Mr. Rooper very deftly dovetails an account of what he saw at the French Exhibition into a comprehensive survey of French education, which again is interesting and instructive to a degree. Next in order comes a dissertation on the 'organisation of education,' upon which peg Mr. Rooper hangs some pregnant remarks, the sum and substance of which may, perhaps, be expressed as follows: (1) a study of medieval schools shows that all modern reforms were more or less nebulously foreshadowed; (2) that it is fatal to the weal of a school for it to be disconnected and isolated from those above it and those below it, which points a moral not fully appreciated even at the end of the nineteenth century.

'Lyonesse' is a charming section of a quasi-biographical nature, setting out strongly the loyalty that Mr. Rooper feels towards his *alma mater*, and discussing '*Home* versus *Education at a Public School*.' That, in ninety cases out of a hundred, the really good public school trains a boy more effectually than can be done at home, has been accepted since the days of Tom Brown and his master, Dr. Arnold, which view of the case is upheld by Mr. Rooper, with whom, however, we cannot agree as to the wisdom of fagging. We pass over several chapters, not willingly but simply because space forbids a more lengthy examination of Mr. Rooper's opinions. In discussing the modern training of girls, Mr. Rooper is all in favour of an increasingly liberal education, both mental and physical. Like Mr. Goldbury in Gilbert's *Utopia*, our reformer hails with delight the change that has come over the physical training of an English girl, rejoicing that

> 'She golfs, she punts, she rows, she swims—
> She plays, she sings, she dances too,'

and it is evident that Mr. Goldbury's ecstatic description finds echo in the desires of Mr. Rooper—

> 'A wonderful joy our eyes to bless,
> In her magnificent comeliness,
> Is an English girl of eleven stone two,
> And five foot ten in her dancing shoe.'

One of the most thoughtful sections in the whole book is that dealing with the 'Methods of teaching children between seven and nine years of age.' Every teacher of experience admits the great difference between the infant school training of a child and that which he receives in the lower standards of the upper school. Mr. Rooper is but fair when he adds to his expression of this truth words which exonerate teachers from the blame attaching to this defect: 'I do not blame the teachers for the meagre education which was long given in the lower standards, for under the system by which the Government contracted to pay a fixed sum of money for every child that the teachers could raise to a certain minimum standard of efficiency, it was impossible for them to attempt a varied programme of studies.' He goes on to add that we have changed all that now, and in so doing he but voices the flattering tale ever told by Hope. The evil that systems do, as well as that done by men, lives after them, and the time is not yet when inspectors will allow, or teachers use, that fulness of liberty which will enable them to avoid 'the hammer, hammer, hammer on the hard high road of the three R's.' But for the curriculum so ably mapped out by Mr. Rooper for the children from seven to nine, we have nothing but the highest praise. For this alone the book is worthy of profound study, and we heartily commend it to the earnest attention of those whose aim it is to be the wisest and best amongst their fellows. How liberal is Mr. Rooper's interpretation of our duty to the youngest of Young England may be gathered partly from what follows:—'No school should be without its aquarium or its vivarium, and the class may be relied upon to bring, when required, cats or rabbits or doves to illustrate special lessons.' The only other chapter that can be noticed in this short and necessarily imperfect account of the reforms advocated by our author is that on 'Handwork in Education.'

That handwork is an absolute necessity, not only for *muscle* but for *mind*, is a conclusion to which one is very forcibly impelled after reading Mr. Rooper's digest of Dr. J. Crichton Browne's evidence in this direction; moreover, this exercise is necessary more especially between the ages of *four* and *fourteen*. In its earlier stages it may consist of cardboard work and modelling in clay, but the almost impassioned plea for Sloyd with which 'School and Home Life' concludes leaves little doubt as to the form that handwork would take had Mr. Rooper the 'wishing-cap.' The effect of handwork is physical, mental and moral, is the further contention of our author, who further claims that it should constitute a part of the ordinary school work to be performed in the ordinary school hours. Any attempt to teach a trade is severely and categorically condemned as shortsighted and uneducational, whereas handwork should aim at developing into a complementary and supplementary part of the great educational purpose observed by a rightly organised and conducted school. Mere joint-making, as practised in so many schools, produces dexterity, but is barren of discipline—a hard saying,

likely to cause much heart-searching amongst the many ardent advocates of this form of handwork, which commends itself to South Kensington and to many zealots equally enthusiastic with Mr. Rooper in developing manual exercises.

For a more complete exposition of the views of Mr. Rooper, we must refer our readers to the book to which we are indebted for the information upon which is based this article. Within the four hundred and eighty pages of this work are many kernel sayings which we have omitted with regret, and many topics—such as Evening Schools and Art in Schools—that we have reluctantly passed over. We hope, nevertheless, that we have said enough to demonstrate how ardently and how intelligently this new addition to the Reformers' Corner has worked to further the good cause of educational reform, and how well he has won his spurs, which no one, we are convinced, will more worthily wear.

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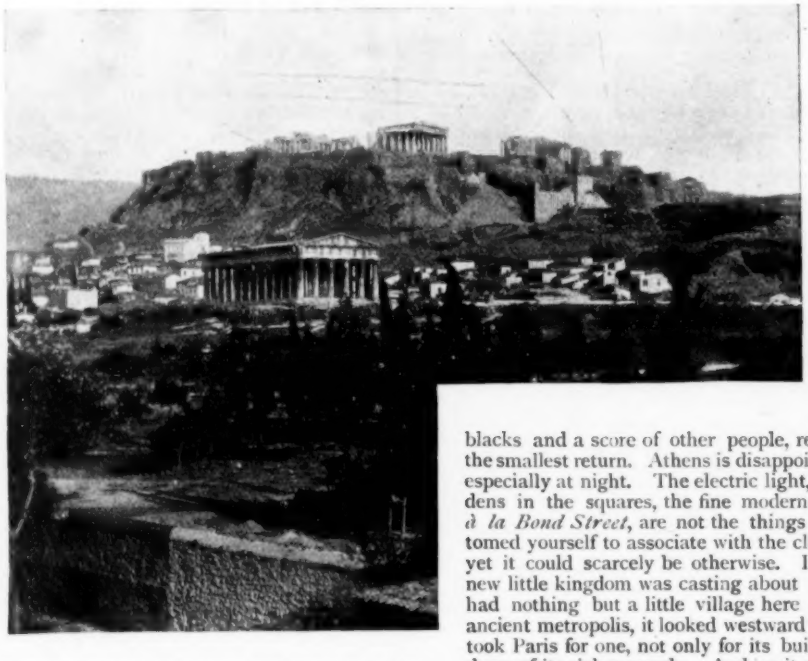
Early next morning the stopping of the engines told us we were at Patras, and soon we stepped ashore to find currants here, currants there, and currants everywhere. The houses were white, the dust was white, and the oxen who drew the vehicles through the streets were white. We seemed now to be in the East, and were not surprised to learn that the natives spoke of the party as people 'from Europe' and regarded themselves as Orientals. We went outside the town, and from a hill-side watched women, dressed much as their very great-grandmothers of Homer's time might have dressed, tending the currant vines. The men, also, beside these women in veil and tunic, were in old-time garb; the poorer people everywhere are the last to relinquish national characteristics; and the ploughs these men were driving differed only slightly from those in use when the siege of Troy was making history. In this town of currants, this very busy port, there seems to be a contest going on between the old, old past and the customs of to-day, but we think to-day will be the victor. As

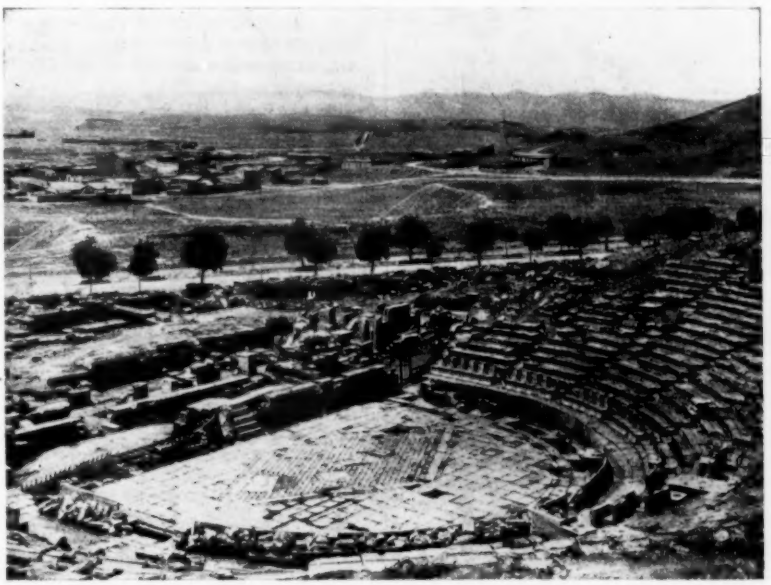
the train was entered one could not but believe the railway will one day level all the differences of all the nations. George Stephenson did more than invent the locomotive, although he knew it not. Before we were far from the town we cast a last look at Missolonghi, where Byron died, and where his death-day is still annually commemorated. Greece, next to Switzerland, is the most mountainous country of Europe, and as you proceed to Corinth you recall all the pretty little myths that hang about these hills which are never out of sight. By-and-bye New Corinth is reached, built near the sea for greater safety after the great earthquake of 1858. But a carriage drive soon brings one to the Corinth of St. Paul, a squalid little village near the few remaining columns of its once famous temple, the temple which met the view of the great travelling apostle. Once 'the eye of Greece' from a military standpoint, and the scene of all that wickedness which its fine commercial position and its thousand priestesses of Venus brought to it; but to-day visited only because of its past. From the Acro-Corinthus you can look down upon Cenchrea, the little port whence St. Paul embarked, and where, doubtless, he decided to write those letters which are known to us as *The Epistles to the Corinthians*. The prettiest sight we saw from this height was every now and again that of a mother and child on an ass led by the husband and father. In their Eastern dress they looked as like as possible to those pictures of *The Flight into Egypt* with which great painters have made us so familiar. But we had to re-enter the train, and soon found ourselves crossing the New Corinth Canal, opened in 1893. Though so recently *un fait accompli*, it was devised by Hadrian and by Cæsar, and Nero went still farther and set his engineers at work there; the remains of their attempt are still to be seen. Now we were at *Eleusis*, viewing the giant remains of that temple of mysteries in which were expressed the best feelings of man in the worship of Demeter. That goddess, according to legend, disguised as an old woman, came here in search of Persephone, her daughter, who had been carried off by Pluto. King Keleos received her graciously and gave her welcome, in return for which the goddess taught the king's young son, Triptolemus, the art of husbandry. The lost daughter was found, and an arrangement was made by which she was to stay above ground with her mother for two-thirds of the year and the remaining time under ground with her husband. The processes of vegetative life are clearly indicated in this myth, and in a very beautiful way. The great festivals of the Eleusiana were established in honour of the gift of the goddess, which raised man from a nomadic to a settled life; and although we have no record of the specific character of the mysteries, we have it on the word of Cicero, one of the initiated, that they taught men 'not only to live happily, but to die with a fairer hope.' This favoured spot was also the birth-place of Æschylus. It still retains much of its primitive condition. Outside the cottage homes are beehive-shaped ovens; we wanted to see one closely, and looking over a low wall to do so, were welcomed nearer by a beautiful young woman, becomingly veiled, who with most natural politeness showed us her mode of oven-heating with wood. We wished we could have spoken the words that rose to our lips in her own language, but the language of the eye had to suffice, and perhaps was enough: it was at the railway station here that an official told us the eye language was the universal one. At that same station we asked for coffee, but not for more of it. Served *à la Turque*, very strong, nauseously sweet, and in very tiny cups, we wondered why this Ottoman abomination was allowed to survive like the brimless hats.

The next stopping place was Athens itself, but some time before reaching it we were made aware not only of its proximity but of its poverty, for irrepressible hotel agents boarded our train, clamouring for our patronage on the indisputable ground that each of them came from the best hotel in the city; and when the station was reached it seemed as though a street riot was at its height, but such was not the case; it was only further relays of hotel touts, plus cab-drivers and porters and shoe-blacks and a score of other people, ready to oblige for the smallest return. Athens is disappointing at first sight, especially at night. The electric light, the well-kept gardens in the squares, the fine modern hotels, the shops *à la Bond Street*, are not the things you have accustomed yourself to associate with the classic name. And yet it could scarcely be otherwise. In 1830, when the new little kingdom was casting about for a capital and had nothing but a little village here on the site of its ancient metropolis, it looked westward for a model and it took Paris for one, not only for its buildings, but for the dress of its richer people. And so it comes to pass you may think yourself in France or in London as you walk through the streets or mount a tramcar and pass shops which are showing Christy's hats or Doulton ware or Stephens' ink. But, nevertheless, the old jostles queerly with the new, for on the other side of the street you may see a flock of goats led to the door of a house from which comes a woman jug in hand to have her morning milk direct from nature's source; and you raise your eyes and there stands the *Acropolis* as it stood in the days of that trio of geniuses—Pericles, the law-giver who inspired the Parthenon; Ictinus, its architect; and Phidias, to whom the ornament is due. There this unrivalled building stands white and beautiful, but in ruins, as left by the Turks in 1688. The marbles lie about like gravestones in a crowded cemetery, and they tell a similar tale. You may see the socket in which was fixed the support of the forty-feet-high statue of the goddess Athene, in whose honour the temple was erected. During its building, the legend says, a workman fell from a height and was disabled, much to the regret of *Ictinus*, to whom the goddess considerately came in the night and pointed to the little *parthenia* plant as a healing remedy. Of course it succeeded, and there it grows to-day, and of course the sentimental of your party fail not to bring some of it away. And



THE ACROPOLIS, WITH THE PARTHENON.—IN THE FOREGROUND, THE TEMPLE OF THESEUS.

near is the Propylea, and the Porch of the Caryatides with those finely modelled maiden forms which are still supposed to be unequalled. You may see one of the originals in the *British Museum*, the one brought by Lord Elgin, and for which he put in position a terra-cotta copy here; and there, too, is the little temple of Nikè Apteros, or the Wingless Victory, as exquisite as finest sculpture can make it. Before the victory of Salamis the goddess had been worshipped winged, but afterwards she was deprived of her wings lest she should fly away and the Persians should come again. You might spend every day of your holiday on this spot and find it all too short, but this cannot be, and so you reluctantly descend, passing as you go the Theatre of Dionysius, where more than two thousand years ago the crowds of Athens used to assemble to hear the tragedies of Æschylus or to laugh at their own foibles in the comedies of Aristophanes. The seats on which the audience sat are as fresh now as then, and the names on the reserved seats as legible as when first cut. In this case to be buried was certainly to live again. Passing the prison of Socrates you come to Mars' Hill, where St. Paul gave that exhortation to the Athenians which will ever associate itself with this tiny elevation. And down below is the Thesion, or Temple of Theseus. This grand old Doric building is the only ancient pile in all Greece which is intact. Neither earthquake nor that greater destroyer, man, has made this a ruin. Alone it stands in a plain where once was an agora or market in which assembled every grade of old Greek life. If only the stones could speak! The Germans are busily digging here, and have made some good finds of an early date. Not far away is the Street of the Tombs, but you leave that for a new day and are content to finish this by ascending Lycabettus and looking over the city, recognising the spots you have visited; and then the sun begins to sink, and, casting a farewell glance at Hymettus close by—the hills on which the bees of Homer's time loved to find their honey—you seek your hotel and are glad to take refuge in the arms of the god Morpheus, who is as familiar to us as to the old Greeks.



THE THEATRE OF DIONYSIUS.

[The second instalment of this contribution will deal with the Schools and Teachers of Greece.]

FUNGI AND THE ROTTING OF FRUITS.—C. Wehmer is of opinion that the fungus which most commonly causes the rotting of fruits is *Penicillium glaucum*, which in the case of apples and pears is accompanied by *Mucor pyriformis*. In the case of medlars the latter is much the most common fungus. Two other closely allied species, *P. italicum* and *P. olivaceum*, are associated with *P. glaucum* in the case of lemons, oranges, and other tropical and sub-tropical fruits. *Mucor racemosus* was also observed in plums. The most common fungi in grapes are *Penicillium glaucum* and *Botrytis cinerea*. The latter species forms the grey tufts on walnuts.

LIFE AT A GERMAN GYMNASIUM.

BY AN EX-GYMNASIAST.

II.

OF all places in which to study the growth and temper of the German nation, the Gymnasium is one of the best. There we meet all the currents which make up the river of German life. There we are brought into contact with the popular substratum and the highest pedigree. Prince and peasant boy sit side by side, according to the whim of the alphabet, which makes Hecht precede Hohenzollern. This was eminently the case at Düsseldorf. There we had scions of the ancient Catholic aristocracy of the Rhine, sons of modern State officials from Berlin, representatives of that backbone of German prosperity—the new manufacturing industries—and boys from the country around who would tramp their six miles to and from school every day: for the Gymnasium is essentially a democratic institution. The poorest workman's son, if he stands well with the priest or with some influential teacher, can obtain a *Stipendium* which entitles him to free education, free books, and sometimes even to a money grant. It is entirely a matter of patronage—provided, of course, that the pupil has a good school record. This was strikingly illustrated in my own case. A teacher whose disposition towards me was very friendly—he was my Ordinarius for several years—obtained a free scholarship for me without my asking. How he did it I never knew, but it was resented in some quarters, and my next Ordinarius, by the simple expedient of spoiling my record on every available occasion, furnished the excuse for discontinuing it. Competitive examinations are unknown, and there is nothing in the nature of prizes and no reward more substantial than a good certificate.

The democratic and popular character of school-life at the Gymnasium serves as an antidote to that virulent class hatred, which is a constant menace to the stability of the German State. The *Gymnasiasten* and the *Realschüler* were continually at war with the elementary school pupils, and we often had a lively time of it in our encounters with bands of armed youths in the surrounding country. I say 'armed' advisedly, for although firearms were strictly forbidden and only rarely used, hollow sticks containing swords and daggers were very common. But a more formidable weapon was the rubber tube loaded at one end with leaden bullets. It was swung round by the other end, and was capable of administering a blow which might well end fatally. When not in use, this tube was worn as a belt. I well remember a defeat, after which we had to take refuge in a factory, whence we were escorted home by the police, the 'enemy' hovering in large numbers at a respectful distance.

It must not be thought that these fights are mere ordinary

school-boy feuds. There is a deeper meaning underlying them. The working population of Germany is systematically oppressed and muzzled by the bureaucracy, and the ground is correspondingly volcanic. It is not so long since no bicyclist dared ride along a high road without a dog and a whip, and many a half-drunken workman would leave the public house with the declared intention of sticking his knife into the first gentleman he met—and do so.

Among the *Gymnasiasten* themselves no such friction was ever felt. Without distinction of religion or social standing, every boy was able to choose what associates he pleased. The parents often encouraged or opposed some intimacy or other, but the free-and-easy intercourse among the boys was never seriously interfered with. In the higher classes there was a tendency to form cliques and coteries, but the mutual attraction was quite as often based upon mental disposition as upon social status.

The proximity and influence of the parents is another element which distinguishes the German Gymnasium from the English public school, just as German University life with its freedom—one might say licence—of residence stands in contrast to Oxford and Cambridge. Many a German teacher must sigh for the English miles which separate the anxious parent from the ne'er-do-well offspring in this country. The curiosity and vanity of parents is annually gratified by the Public Examinations, the sorriest farce that ever disgraced a public school. Each class was examined for half-an-hour in two subjects. It happened as often as not that the boys knew the question beforehand, the less conscientious masters having taken them through a 'trial examination' the day before. That the examinations showed anything but the nervousness of pupils and teachers has never been seriously maintained.

HERR OBERLEHRER MATHIAS EVERS,
The Royal Gymnasium, Düsseldorf.

The English school system, with its many radical differences from German ways, has been the subject of serious study by German educationalists. The manly physical training imparted to English boys by their out-door sports has always been an object of envy and emulation. The absence of the boarding system has been felt to be an almost insuperable obstacle to the introduction of regular ball games, but I believe a still more weighty reason has been the rarity of meadows. Tourists in Germany have often been struck with the prevalence of tillage over pasturage. The German peasant finds the former pay best, being protected by heavy tariffs. He makes the best soldier, and hence he is pampered by the State. Germany may be 'sunny,' but it is certainly not green. —Hence the absence of cricket and football. Recently some attempts have been made to organise *Fuss ball* clubs, but they have originated exclusively among the boys themselves. However, the 'powers that be' were not to be so easily discouraged. It was decided to take the boys out into the open 'after the English model.' It was ordained that each class should make four excursions during the summer, accompanied by its teachers. That was for some time rigidly carried out with most amusing results. I was in the Tertia at the time. The boys assembled at the school and marched to the station. We were supplied with tickets at reduced fares and seated in third-class carriages (not fourth-class, which only has standing room). We went out of town for a station or two, and then walked along the high road or through the woods to an inn, where we had coffee and bread-and-butter. It being a rainy day, most of us stayed indoors doing all kinds of mischief. Our Ordinarius, Dr. C——, invented a game which kept us amused for some time. He squatted on a table and held in his hand a stick. To the end of the stick was attached a string, and to the end of the string a cork. The whole arrangement formed a kind of fishing rod, with the cork for bait. We all stood round with our mouths wide open, and he dodged the cork about our noses. The boy who was quick enough to catch the cork with his teeth was rewarded with a pot of beer!

On another occasion, when the day was fine, we walked through the woods. The smaller boys played at hide-and-seek among the trees; the elder boys walked about in groups of three or four talking about—well, mostly rubbish. The teachers kept apart. Occasionally, when a boy went to talk with them, he was charged with sarcastic messages and requests to be well recommended to his friends the teachers. One of the objects of these excursions—to bring teachers and pupils into amicable relations—was a conspicuous failure.

There was only one teacher who really succeeded in winning the hearts and the confidence of his pupils. It was Oberlehrer Mathias Evers, the Protestant *Religionslehrer*. He was also Ordinarius of one of the Secundas, and I had the privilege of being under his charge for several years. He was quite an exceptional man—brilliant, original, enthusiastic, and gifted with a rare power of understanding and influencing youth at its most impressionable age. He drew forth all the best qualities of his pupils, and succeeded in breathing into them some of his own aspiring genius. His lessons were the only ones which never were dull. They were always eagerly looked forward to, even by the most indolent and *blasé* among my schoolfellows. His religious instruction dealt fully and frankly with modern Bible criticism, which in his hands only served to throw the stately and unsurpassable grandeur of Hebrew and Christian traditions into bolder relief. It is only those who have come into close contact with the deadly scepticism of intellectual Germany who can truly appreciate the success with which Herr Evers kept the fire of ideal aspiration burning in the hearts of those confided to his care. It is no wonder that the boys should have been very much attached to him, and that he should have been the object of envy and even aversion to those less gifted or fortunate than himself. I do not know whether he is still there, having been out of touch with the school for ten years, but the pleasantest recollections of my German school days have always centred about him.

(*To be concluded.*)

CARBOLIC ACID AS A MEANS OF TEMPERING STEEL TOOLS.—M. Levat has recently made some experiments as to the possibility of tempering steel tools by the use of carbolic acid. He tempered one cold chisel in water, and another in a solution of carbolic acid after both had been heated to a cherry-red. The chisels were then set to work on extra hard wrought iron, and it was found that the one tempered in water became notched after a short time, while the one tempered in carbolic acid remained perfectly intact. A second test was made with two puddled steel bars, which were heated to a white-heat, and tempered in water and carbolic acid respectively. The bar tempered in carbolic acid showed a much finer fracture, which reflected like a mirror when filed, and its carbon contents were not increased. In the bending test it showed more elasticity and pliability than the other, while its hardness made it more suitable for tools.

EDUCATION ABROAD.

THE Prussian Bill for the regulation of teachers' salaries has at last been passed into law. There was some anxiety lest it should again be thrown out by the Herrenhaus, and more especially by the burgomasters representing the larger cities, whose state-aid is curtailed for the benefit of the rural districts. But they proved more pliable than was expected, and so did the representatives of the clerical parties, the Conservatives and the Centre, who had demanded a decided step towards denominationalism. The teachers are very grateful for the long-expected boon of a state-regulated salary. Hitherto the parish fixed the salary quite arbitrarily, and the state gave additional grants in proportion. By the new law the minimum salary is £45, and the age increase (*alterszulage*) begins with the eighth year of service at the latest. The latter, which is as a rule paid by the State, has been nearly doubled in the smaller towns. The city paying the highest aggregate is of course Berlin with £20,000. Next comes Frankfurt-am-M. with £4,500, Cologne with £3,300, and Breslau with £2,900. Some 50,000 rural teachers are endowed with additional age increases amounting in the aggregate to £40,000.

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THAT the Prussian schoolmaster, 'the victor of Sedan,' should have such a hard fight for a small salary will surprise those who regard Prussia as the source and centre of all things educational. Even in Russia things are better. On the 1st of April the new scheme of salaries will come into force, according to which country teachers will receive salaries ranging from £48 to £80, and in the smaller towns £60 to £100. The highest salary is attained after 25 years' of service, and the pension is half the full salary, or the full salary after 45 years' service.

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THE Danes are still more liberal towards their teachers. Copenhagen is discussing a scheme for the increase of salaries, which are to begin at £80 and to rise by four triennial steps to £140. There is very little doubt that this will be agreed upon. Denmark has of late advanced by leaps and bounds. From one of the poorest it has been converted into one of the richest countries in Europe, solely through the efforts of a wise administration which developed all the resources of the country and the capacities of the people, and fostered the spirit of self-help.

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THE *Danmarks Laererforenings Medlemsblad* issues an appeal for the formation of a youthful society for the prevention of cruelty to animals (*De unges Forbund til Dyrenes Beskyttelse*). It calls attention to the fact that England was the first country to call for the protection of animals, and that the first children's society for that purpose was formed there 21 years ago. The proposed association is to federate all existing local societies, and is to issue a periodical devoted to the cause. It will be strange if the country of Hans Andersen does not gladly respond to this appeal.

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IN Austria the wave of clericalism, which is just now sweeping all over the world, has reached its most pronounced form. There the Ultramontane party are pushing their advantage with a relentless vigour which fills with dismay all friends of primary education. The fourth Austrian Catholic Congress was held last October at Salzburg. It demanded the repeal of the School law of 1869, the re-establishment of the denominational schools, and the supervision of the schools by the Church. This manifesto was followed by a strong protest from the *Deutsch-Oesterreichische Lehrerbund*, representing 14,000 teachers, and since then the struggle has been fierce and strong. Lower Austria is at the mercy of the Christian Social party, and its head, Herr Lüger, has announced his intention of dealing summarily with the 'neutral' school. The Vienna City Council has dismissed all teachers who were provisionally appointed, to clear the ground for adherents of the majority. Bills have been introduced in the provincial Diets for reducing the compulsory school attendance from seven to six years, and for giving the hierarchy a determining voice in the appointment of teachers and the selection of the plan of studies. Catholic teachers' societies are founded everywhere, and those who do not join them are persecuted by public denunciation and private intrigue.

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IT is significant that the sum allocated to primary instruction in the Austrian Budget for 1897, shows a reduction as compared with last year. The Minister of Public Instruction, Dr. von Gautsch, swims with the stream, and the teachers are having recourse to the fundamental expedient of influencing the *Reichsrat* elections in their favour, by putting their views and grievances before the election meetings. They are everywhere received with favour, as the masses of the people are on their side.

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FROM Austria to the Balkan Peninsula is not much of a step, as we soon may have reason to know. We learn from Constantinople that the directors of all public and private schools were summoned before the Ministry of Education and were informed that no pupil should be forced to acquire knowledge. The teachers were to adhere strictly to the official text-books and to be satisfied with reading the lessons from the books as prescribed. All explanations or remarks not belonging to the subject were strictly prohibited. Teachers were in future not to assemble in conference, and directors were instructed to have any teacher immediately arrested who should express any political opinion or criticise the Government. It is but fair to add that these regulations are strongly disapproved of in well-informed Turkish circles.

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AT Athens the University has been the scene of a serious disturbance. The students quarrelled with Professor Galvini and took armed possession of the University building. The Government thereupon surrounded it with troops and cut off the water supply. There was some firing, but the students eventually capitulated. Most of them are now probably in Crete or on the Thessalian frontier, where they will have plenty of play for their surplus energies.

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THE Italian students' riots are not quite fizzled out yet. The Universities of Bologna, Cagliari, Genoa, Macerata, Modena, Padua, Parma, Pavia, Sassari, Siena, Turin, Pisa, Catania, and Messina were re-opened on the 4th of March. Those at Rome, Naples, and Palermo are still closed. The agitation which attained such large proportions was essentially a demonstration against Signor Gianturco, the Minister of Education, who has by his disciplinary measures made himself very unpopular. It is rumoured that the Minister is about to resign.

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A delightful scheme of travel has been set on foot among the Italian students which will, it is to be hoped, not be interfered with by conflicts with the Government. They are to proceed on a trip *viâ* St. Gothard, Strasburg, the Rhine Valley, Cologne, Berlin, Leipzig, Bavaria, and the Tyrol. Tickets including all expenses are issued for £8, and the start is to be made from Milan on April 10th. The Government has reduced the fares on all the railways for the trip, and the colonies of Italian students at the various German and Swiss Universities will give their compatriots a hearty reception. The movement was inaugurated at Pavia by a lecture called 'Across-the Frontier' by Professoress Paolina Schiff.

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ACCORDING to the *Rinnovamento Scolastico*, 38 pupils of Rieti College, accompanied by Rector Vicenzini and the gymnastic instructor, executed a forced march from Rieti to Terni, a distance of 23 miles, in six hours and three-quarters. The pedometer gave 45,580 paces. The Italian military pace is the quickest in the world, and the above record shows that the Italian soldiery is trained for it while young.

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IN Madagascar the French Government has established an Artisan School with the object of training efficient native workmen. Qualifications for admission are French, reading, and writing, a little arithmetic, and an undertaking to attend a full year. At the same time a decree of the French Resident

has abolished slavery throughout the new colony. These two acts are a distinct gain for the cause of civilisation.

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THE German West African colonies are well provided with schools, but the annual mortality among European teachers is alarming. Little Povo has a school of 200 pupils, who are taught reading, writing, singing, and three languages: Povo, German, and English. They range in age from 4 to 28, and are distributed in 18 classes. There evidently is a determined attempt at method, and no lack of subjects. Imagine a Povo negro boy who is master of three languages! It should not be very long before he is once more master of Little Povo.

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IN Japan education has not suffered by the war. In 1894 the number of elementary school pupils was 160,000, or 27,000 more than the year before. Besides this the kindergarten system is well developed. Of these there are 143 public and 53 private ones, with 394 teachers and 14,700 children. The number of children in the kindergarten schools has been rapidly increasing. A model establishment is maintained by the Government in connection with the female teachers' seminary at Tokyo.

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TURNING to America, we find Costa Rica and Uruguay far ahead of the rest of South America in the number of school pupils. They form 9 per cent. of the total population. Argentine, Paraguay, and Mexico come next, and Peru, Columbia, Bolivia, and Brazil come last with less than 2 per cent. In Costa Rica, with a population of 243,000, the number of primary schools in 1895–96 was 143 for boys, 137 for girls, and 36 mixed.

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IN Chile there has recently been considerable progress in educational matters. Two new schools are being built in Valparaiso, which are to cost 23,400 pesos. Two more are to be built at Iquique, two at Chillan, a female teachers' seminary at Concepcion, and a lyceum at San Fernando. According to a new law, teachers of 30 years' service are to have the right of a pension of three-quarters of their total salary.

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IN Canada the Manitoba school question still awaits settlement. Premier Laurier has proposed a scheme of local option for religious instruction, but it does not satisfy the Catholics.

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AN interesting law case is reported in the Belgian *Journal des Instituteurs*. At Rummen two schools existed up to 1884, one for boys and one for girls. The latter was suppressed in 1884, and the teacher, Mlle. van Hove, was placed *en disponibilité*. In 1889 a mixed school was established, and a male teacher was appointed as master. Mlle. van Hove, however, claimed that as her school had been revived she was entitled to re-enter upon her duties. The parish council refused to recognise this claim, and the case was brought before the provincial court at Louvain. The decision was given in favour of Mlle. van Hove, who was declared entitled to her full salary, with interest, from the date of the illegal appointment of the new teacher. An appeal to the superior court at Brussels only confirmed this decision, which gives Mlle. van Hove the sum of 6,000 francs and 1,568 francs per annum. The case is important, as proving the efficiency of one of the Belgian safeguards against arbitrary treatment by the local authority.

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WE have much pleasure in calling attention to a circular issued by the German Association for Manual Instruction, which can be obtained through Dr. Götze, Ander Pleisse 2 E, Leipzig. It contains the programme of the spring and summer courses of manual instruction for teachers at the new school in Scharnhorststrasse, Leipzig, where teachers are shown how to perform the principal tasks in cardboard-work, wood-work, chip-carving, modelling, metal work, and glass work. The spring term begins on April 22nd and ends on May 26th. The fees are 25*s.* per week, and the journey is covered by three or four pounds. Further courses begin on June 28th, August 2nd, and September 6th. The school works under the rules fixed by the Strasburg Congress on Manual Training.

NOTES AND NOTIONS.

BY T. B. ELLERY, F.R.G.S.

Ex-President of the National Union of Teachers.

The Coming Conference. We are all looking forward to the Swansea Conference. It does not seem a year ago that we were enjoying the delights of 'breezy Brighton,' yet, so swiftly does time fly, here we are within measurable distance of Swansea!

On the opening day the following deputations are expected to attend: From the Educational Institute of Scotland, from the Irish National Teachers' Organisation, from the Fédération Générale des Instituteurs Belges, from Het Hoofdbestuur van het Nederlandsch Onderwijsers-Genootschap, from Hoofdbestuur van den Bond van Ned. Onderwijzers, and from the National Co-operative Union.

For the first time, I believe, we are to have three private sessions, the third, fifth, and sixth (Tuesday and Wednesday afternoons and Thursday morning). This is absolutely necessary, so much business of a 'domestic' character demanding attention.

On Monday evening the annual meetings of the Provident Society, the Orphanage and Orphan Fund, and the Benevolent Fund will be held. In all probability the proceedings will be more than usually interesting, a lively debate being expected on the resolution which I am to move: 'That in future the two Funds be managed by one Council.' At the Temperance Breakfast on Tuesday morning, in the Shaftesbury Hall, addresses will be delivered by Principal Roberts (Aberystwyth) and Dr. J. A. Rawlings (Swansea). An hour or so later we shall know the result of the election of Vice-President and of the Executive for 1897–98. Unfortunately, this year we have had more than one unpleasant incident in connexion with the competition for these honours. It will be a happy relief for everyone when the results are made known once for all, and the competition, with its unfortunate display of feeling, is over. Mr. G. M. E. Hamilton will once more be declared re-elected to the office of Treasurer. The honour is well deserved, for no man has served his fellows with greater zeal and fidelity than Mr. Hamilton. Long life and many similar re-elections to my old friend and colleague!

Topics for Discussion. After the announcement as to the place of next Conference—in view of the invitation of the Town Council of Cheltenham there will be an undivided vote, I imagine—Manchester will lead off with 'Drawing,' then the Education Question will be introduced either by the Executive or by Sheffield, after which we shall discuss Government Grants, London University and Education, the University Court of Wales, Inspection of Schools, the School Year, and finally, Teachers as Civil Servants, a very interesting report on this subject being, by this time, in the hands of all the representatives. On the following morning we shall be asked to deal with the Code, Superannuation, the Half-time System, Log-book Entries, Salaries, Staff of Schools, Registration of Teachers, School Attendance, etc.

During the private sessions we shall have the Treasurer's report and balance sheet and Auditor's report before us, the question of a reserve fund, and the new agreement made by the Executive with the Educational Newspaper Company. When these matters are disposed of, the proposed alteration of rules will come up for discussion, the first question being the constitution of the Executive. Shall it be the present system of members declared elected at Conference *plus* District Union representatives, Electoral Districts simply, members declared elected at Conference simply, or shall it be a combination of the last-mentioned and District Unions, the

travelling expenses of all being defrayed out of the General Fund? A very keen debate on this question is confidently expected, and it is to be hoped a decision will be arrived at. One thing is clear—the present anomalous character of the representation of the Union upon the Executive must receive attention sooner or later—the sooner the better. The West Ham question will be re-opened, there will be a motion to defray out of the Union funds the out-of-pocket expenses of representatives to Conference (if this is carried there must be a further motion to increase the annual subscription), and our old friend, the Sustentation Fund, will once more make his Conference bow!

Other Conference Items. The annual Reception of Purses, containing contributions to the Teachers' Benevolent Fund and the Orphanage and Orphan Fund in connexion with the N.U.T., will take place in the Albert Hall, Swansea, on Thursday afternoon. Lady Jersey, who is no stranger among us, has kindly consented to receive the purses. What will be the total amount? Shall we fall short of the nine or ten thousand pounds of Brighton, or shall we go beyond that and touch the fourteen or fifteen thousand pounds of Manchester? I fear we shall not go beyond the ten thousand, but, of course, no one knows yet. There will probably be a ball, a reception by the mayor, college re-unions, and, for those who belong to the fraternity, a Masonic gathering of some interest. Altogether the week promises to be a busy one. Of one thing we may be quite certain—our Welsh friends will spare no effort to ensure the comfort and happiness of the representatives present.

They are determined that at least they will not fall short of Brighton and former Conference towns, in the endeavour to give satisfaction. I believe everyone is looking forward to spending a really good time in Swansea.

The Local Officers. As at present arranged, at 12.30 p.m. on Wednesday, we shall be asked to pass votes of thanks to the local officers and committee. The officials of the Local Conference Committee are Mr. J. Rhys Davies (Chairman), Mr. J. Evan Jenkins (Vice-Chairman), Mr. T. Roberts (Treasurer), Mr. D. Davies (Secretary). At the same time we shall certainly not forget Mr. J. W. Cadwalladr (Chairman), Mr. T. Madge (Vice-Chairman), Sir J. T. D. Llewelyn, Bart., M.P., and Mr. T. H. Morgan (Treasurers), Miss E. J. Davies, Miss C. Mitchell, Mr. H. Rowland Wakefield, and Mr. J. Williams (Secretaries), and the members of the Benevolent Purposes Committee.

It has been proposed that an illuminated address shall be presented to the Chairman and to the Secretary of the Conference Committee. I hope the suggestion will be adopted.

Further Conference Notes. The local efforts to raise a large amount for the charities have included concerts by the children, lantern entertainments and lectures, a bazaar (three days, March 10th, 11th, and 12th), and sales of work at centres. The Countess of Jersey, who receives the purses on Thursday in the Albert Hall, will be supported by the local M.P.'s, the Mayor of Swansea, etc., etc.—Principal Salmon and Miss Hendy, with the local lady teachers, are organising a Ladies' Meeting for Tuesday evening. The college authorities, adopting a suggestion by Mr. Salmon, have decided to welcome for the week all old students, up to the limit of accommodation.—The Publishers' Exhibition will be held in New Market, a few minutes' walk from the Conference Hall. Here we have the reception room, post office, dining rooms, cloak rooms, etc., etc., and I understand the Exhibition itself will be the largest ever held.—Representatives may become honorary members of the Conservative Club, Liberal Club, and Royal Institution on application.—The Mayoral Reception will take place in the Free Library on Wednesday night. The ball is fixed for the same evening in the Albert Hall.—In the matter of excursions, there will be evening trips round the Bays, if desired. Arrangements have been made for single fare double journey trips to the Mumbles by steam trams.—The proposed arrangements for Friday are as follows:—

(*a*) Day sea trip to Ilfracombe.
(*b*) Brakes to Gower, Mewslade Bay, Parc le breos (day trip). Parkmill, etc., visited.
(*c*) Visit to Works (half-day, 9 a.m.–1 p.m.), Iron from blast furnace, etc., etc.
(*d*) Brake trip (half-day, at 2 p.m.) to Penllergaer, residence of the town M.P., Sir J. T. D. Llewelyn, Bart.

—On Saturday there will be, if required, a repetition of *a*, *c*, *d*, and a half-day trip through Bishopston Valley to Pwll Du.—Arrangements will be made for lads wearing badges to meet all trains at the railway termini on Saturday and Monday in order to direct visitors to hotels, lodgings, etc.

The Report of the Executive to Conference. The Executive may, I think, well claim that the retrospect is full of comfort and encouragement, and is justified in considering that the future is rich in hope. Members who take the trouble to read the Report will be gratified at the progress made, and at the healthy condition of every branch of the work at the present time. The increase in membership is simply marvellous. In 1877, just twenty years ago, our numbers were 10,334; in 1887 (the year in which I first became associated with the Executive) we had reached close upon 14,000. To-day we stand at 36,789! During the years 1890–6 the increase has been considerably over 20,000, or at the rate of nearly 3,500 a year. With such an increase in membership there has naturally been an increase in work and responsibility, and I venture to say that the Report will show there has been no failure on the part of the officials of the Union or of the Executive. In the Law Department *over eleven hundred separate cases* have been dealt with during the year, and the amount spent on law costs has been £1,800, as compared with £1,300 last year. As a very large number of lady teachers are still without the Union fold, I make no apology for giving a short extract from the Report.

'The following are typical instances of actions taken on behalf of ladies during the year:—

(1) A mistress of a school received notice of dismissal. A member of the Law Committee visited the neighbourhood and induced the managers (*a*) to withdraw the notice of dismissal and to receive resignation of the mistress; (*b*) to give the mistress a thoroughly good testimonial; (*c*) to publish a statement in the parish magazine clearing the mistress from any charge of incompetence or incapacity.

(2) A mistress resigned her situation, but did not receive all the salary which was owing to her. She made three futile applications therefor, and then placed her case in the hands of the Law Committee. One letter from the officials of the Union was sufficient to induce the managers to forward a cheque for the full amount.

(3) A parent of a scholar attending a certain school charged a mistress with excessively punishing one of her children. An application for a retractation and apology was unsuccessfully made. The Law Committee instituted proceedings, and obtained judgment for £50 and costs. The £50 has not yet been received, but when it is received it will be handed in its entirety to the mistress.

(4) A member of a School Board libelled a mistress in the service of that Board. This member had rendered himself obnoxious to the mistress in many ways. The Union took action against him to recover damages for libel, and obtained a judgment for £25 and costs. The man had not the money to satisfy the judgment. The Committee followed up the judgment by forcing the man to become a bankrupt, and thus vacate his seat on the School Board, much to the relief of the mistress concerned, as well as to other teachers working under the same Board.'

Other Interesting Particulars. Turning to the charities of the Union, it is gratifying to find that the Benevolent Central Committee was able to dispense more than £3,000 in temporary and permanent relief to teachers and their widows, and the Orphanage and Orphan Council another £3,000 in support of orphans. About 60 annuities of £30 or £25 are now being paid; about 70 boys and girls are in our homes, and 133 other orphans are receiving 5s. a week. And yet there are teachers who have never subscribed either to the one fund or to the other! Would that the figures given above, together with other details of the glorious work, could be brought under the notice of every one of them!

The *Provident Society* is making rapid strides. During the past year 756 new members were added to the roll, the total membership being now 3,157. The income for the past year has not fallen far short of £12,000, whilst the accumulated funds of the society stand at nearly £29,000.

The Examination Board.—The new departure to which I have already referred in these 'Notes,' has set to work in real earnest. Last February pupil teachers were examined at 64 different centres, and it is evident, from the many letters of thanks already received, that the arrangements made and the questions set gave general satisfaction. The issue of a junior commercial certificate will be the next step.

Arrangements have been made for the presentation of an *illuminated address to local officers* who have served not less than four years. Here, again, the action of the Executive seems to have given considerable satisfaction.

Technical and Secondary Education has received very careful attention during the year. Mr. C. James, the Assistant-Secretary, continues to represent the N.U.T. on the Technical Education Board for London, and Mr. T. A. Organ, B.A., the able and popular Law Clerk, who is also upon the Board as a member of the London County Council, has recently been appointed Chairman of its Science, Art, and Technology Committee. It is worthy of note, too, that the following teachers have been elected upon the Central Board for Intermediate Education in Wales :—Mr. H. Bedford and Mr. W. Tegarty to represent North Wales ; Miss H. Williams, and Messrs. W. Brockington, B.A., and T. John to represent South Wales.

As the space at my disposal is limited, I cannot on this occasion refer to other interesting items in the Report of the Executive to Conference, the whole of which, I can assure my PRACTICAL TEACHER friends, is well worth reading.

Superannuation Prospects. Mr. Balfour's statement, in reply to a question in the House, that the question of Superannuation for Teachers in Primary Schools could not be dealt with by the Government until the *pending* and *promised* educational legislation has been satisfactorily disposed of, cannot be held to be a fulfilment of promises made to us on so many occasions. Even the most patient among the members begin to feel that some action must be taken ere long. I have been Chairman of the Union Superannuation Committee for several years, and I have always preached *patience*, believing that anything like haste or a display of temper would seriously injure the cause we have at heart. Even now I am convinced that anything approaching open rebellion will be fatal to our chances both in 1897 and in 1898.

My colleagues on the Superannuation Committee have a very difficult task—a task which will become all the more difficult if their policy is to be attacked at every supposed postponement.

Though no public statements have been made by us—and they have not been made for many reasons—the work has been going on, no opportunities have been missed, no one has been asleep ! I trust that members will continue to give us credit for doing our best. Those of us who have borne the burden and heat of the day have, of course, been as sorely disappointed at the non-fulfilment of the promises made to us as the members of the Union generally, but we have steadily gone on with the work, never losing heart, and that, I believe, must be our policy for a little while longer.

THE INSPECTOR'S NOTE-BOOK.

BY AN INSPECTOR OF SCHOOLS.

April, dress'd in all his trim,
Hath put a spirit of youth in every thing.
The lays of birds, . . . the sweet smell
Of different flowers in odour and in hue.—*Sonnet.*

The time for Nature Teaching. Now is the time to call in the aid of Nature in our teaching. In most schools the lists of object-lessons will contain some Nature topics. Encourage the children in suburban and rural schools to keep a look-out for the first appearances of the welcome flowers—'the rathe primrose that forsaken dies,' and 'cowslips wan that hang the pensive head.' In one school I visited last spring the master, by the aid of the children, had compiled a list of the flowers of his locality in the order of their first appearance. The scholar who brought him the first specimen of each flower received, I believe, a penny. Even where very little Botany is included in the actual curriculum there is no reason why the scholars should not be encouraged to observe nature in an informal way. The children will gladly obtain specimens of leaves and roots for you, as well as blossoms, and are thereby giving themselves real object-lessons. April is one of the best months of the year for flowers, for then we get 'sunshine and rain at once.' In March the following common plants have already blossomed :—Butterbur, Primrose, Marsh Marigold (water-blob), Anemone, and Sorrel. In April you may expect your scholars to observe the 'glowing Violet,' Cowslip, Cuckoo-flower, Blackthorn, Buttercup, Blue Bell, Wild Strawberry, early purple Orchis, Lords and Ladies, Garlic, Red Campion, Woodruff, Wallflower, Comfrey, Stitchwort, and Solomon's Seal. I am told by teachers who take plant-life for their object-lessons that the children are delighted to study flowers.

* * * * * *

'The lays of Birds.' And then there are the birds. This is the time *par excellence* to get in a little casual instruction touching this joyous side of Nature. In the poetry or the object-lessons there will most certainly be some references to the commoner birds. One of the most interesting courses of study I ever examined was one on Birds, taken as a class subject with the upper standards. The Code deprecates the use of stuffed specimens, and indeed there is no need of such. Teach the children to observe the lark, sparrow, thrush, crow, pigeon, fowl, duck, etc. in their normal surroundings. It is surprising how ignorant children are in this subject. They frequently know next to nothing about the common sparrow. Encourage the town children to take walks on Saturdays, and to observe the birds and plants. Some masters, I know, who during the summer take a score or so of the elder scholars for walks once a fortnight or once a week. An evening walk is very instructive sometimes.

* * * * * *

P.T. Examination, April 10th. Of events affecting teachers there is the Spring Pupil Teachers' Examination This takes place on the 10th. It will not be out of place to give, at this juncture, a few reminders respecting this examination. In the first place, if you have received no communication from the inspector asking for particulars as to the number of pupil teachers coming from your school let me ask you to get your manager to send in at once that information. This, of course, does not apply to the schools whose P.T.'s sit in October. Secondly, a word as to the candidates. At the last examination considerable confusion was caused because numbers of the candidates did not know their *locus standi*. Each candidate should clearly understand whether she is to be examined as a probationer (Art. 33), or as a candidate for engagement as a pupil teacher (Art. 35). The April examination will be held under the conditions required by the Code of 1896. Thirdly, it would be well if every head teacher gave the pupil teachers the full and correct name of the school. It is insufficient for a teacher to describe herself as from the Wesleyan School, or St. John's, for instance. They should give the town, the name of the school, and the department, *e.g.* Redruth, Trewirgie, Boys. Then it should be remembered that *flat* rulers are barred, *round* rulers only being allowed. All 2nd and 3rd year pupil teachers who have not read and recited before the examination, should apply to the presiding Inspector, who will inform them when they can be heard. The Practical Music marks are worth having, and can be procured generally at an inspection visit to the school. So also can the marks for practical teaching.

* * * * * *

Certificate Examination—Reading and Recitation. All candidates for the Certificate Examination in June, who have not read and recited, should be getting ready to perform these exercises. At the next inspection visit you should present yourselves to the Inspector in these subjects. The marks in practical teaching can also then be secured.

There would be no harm in asking, before the end of the visit, whether the marks for practical teaching have been assigned.

* * * * * *

The new Code changes therein.—There are no radical changes this year in the Code. It will, perhaps, be of use to some of my readers if I summarise the most important alterations :—

I.—Code of Regulations for Day Schools.

(1.) Probationers must for the future come up for examination annually, so long as the managers require them recognised as such.

(2.) None can become pupil teachers in town schools who are less than 15 years old.

(3.) Irish 1st class and 2nd class untrained teachers are recognised as assistant teachers for one year.

(4.) Graduates of any University in the United Kingdom are recognised as fully certificated teachers, providing they have procured one of certain specified certificates in the Theory and Practice of Teaching.

(5.) Irish teachers, trained and certificated in the 1st class, are recognised as fully certificated.

(6.) Agreements between managers and teachers must, in future, be in writing.

(7.) In the event of sudden emergencies, managers may close their schools without notice, without fear of the £1 fine.

(8.) The grants for specific subjects will, in future (for any school year beginning after August 31, 1897), be made mainly upon the attendance, and not upon individual examination.

(9.) The requirements in Schedule V. for candidates are new.

II.—The Revised Instructions to Inspectors.

(1.) Reports are for the future to be general. Details are to be communicated orally, except when the grant is raised or lowered.

(2.) Periodical examinations by the head teachers are advised—quarterly.

(3.) Notice may be given of the second visit.

(4.) The grant should not be lowered unless there is a distinct falling off.

(5.) Children obviously unfit for Standard I. should be taught specially and separately until they are able to take up Standard I. work.

(6.) Laundry-work, cottage-gardening, etc., are dealt with very fully for the first time.

(7.) Needlework.—'A sufficient supply of material should be kept in hand in each department to enable the scholars to work any exercises suitable to their class which the Inspector may select.'

(8.) Regarding registration.—'If no information can be obtained the name of any scholar may be removed after a continuous absence of four weeks.

(9.) 'In Day Schools the marking of the registers for the afternoon meeting may not commence within an hour of the close of the morning's meeting.'

This is to prevent teachers from marking twice in the morning.

(10.) Appendix X., the useful circular on Varied and Suitable Occupations is an addition.

ANSWERS TO CORRESPONDENTS.

G. H. R.—Your French master can become eligible for a post as assistant master in any Government-aided school by passing any one of some 20 examinations specified in the Code of Regulations for Day Schools, pp. 9 and 10 (from any bookseller, 5½d.). The London University Matriculation Examination and the College of Preceptors Examination for the Teacher's Diploma are fair types of these. Perhaps he might prefer to take the Government Queen's Scholarship Examination in December. This would also admit him into the profession.

Having passed an examination your friend should then answer advertisements in the *Schoolmaster*. I shall be glad to supplement this reply if you need it.

A. J. P.—You will not have to take Arithmetic again. It would be as well to notify the Department, and you might at the same time ask about the Arithmetic to make quite certain. Write at once.

F. R. P.—Under the circumstances I strongly advise you to take up the B.Sc. Course. As you say it is more marketable in your position than the M.A. The difficulty respecting the Biology might be surmounted by attending the U.C.C. Vacation Classes in your holidays. Write to the Secretary of the U.C.C., Red Lion Square, Holborn, London, W.C.

Communications for this column should be addressed INSPECTOR, c/o The Editor, 33, Paternoster Row.

OUR SCOTCH LETTER.

Money Prizes to Scholars.—The Accountant of the Scotch Education Department has intimated that the giving of money awards by School Boards out of rates for school attendance is open to objection, and has suggested that some system other than money awards should be adopted. Such a reminder should scarcely have been necessary, as the Code is quite explicit on the point.

Inattention in Children.—Dr. Bruce, Edinburgh, has been lecturing to the Eastern branch of the Secondary Teachers' Association on 'Inattention in Children.' Dr. Bruce explained that in every act of attention or thinking there is a muscular or motor element necessary to the development of an idea. This fact he clearly illustrated by getting his hearers to think with closed eyes of a circle which he had drawn on the blackboard, when they felt the eyes executing faint movements which, on being analysed, were found to be in reality a tracing of the outline of an imaginary circle. He showed that there is in every idea a motor element of the same nature. This motor act is not, however, necessarily one of movement; it may be one of *fixation* of muscles, as in the case of rapt attention. In dealing with the question of the transmission of impulse the lecturer explained that the second passage along a particular nerve-path is accomplished with less risk and greater ease than the first, a law which should emphasise the value of frequent repetition. In conclusion he stated that the most serious and the most common causes of inattention are defects of sight, many of which are not evident until careful examination of the eyes is made.

The English Education Bill.—The English Education Bill has been the subject of discussion at several branch meetings of the Educational Institute. The Aberdeen branch has unanimously passed the following resolution regarding it :—'That in the opinion of this meeting the Education Bill at present before Parliament contributes nothing to the solution of the Education problem, is fitted to divert the attention of the community from the real question at issue, is directly opposed to the interests of national education and of teachers, and for these and other reasons it is retrograde in its character and unworthy of the support of educationists or of the country.' The chairman, Professor Paterson, for his personal satisfaction expressed the opinion that the branch should not have taken any action in the matter.

The 17s. 6d. Limit.—The Glasgow branch condemns the removal of the 17s. 6d. limit on the ground that it had hitherto safeguarded both pupils and teachers from undue pressure, and had encouraged managers to make an adequate expenditure upon school staff. The change does not, however, apply to the Scotch Code.

Death of Mr. Welsh, H.M. Sub-Inspector.—Sincere regret will be felt by all connected with the teaching profession at the intimation of the death of Mr. Hugh Welsh, H.M. Sub-Inspector of Schools. Soon after the Education Act came into force Mr. Welsh was appointed an Assistant Inspector for the Aberdeen district, and some years ago he was promoted to the grade of Sub-Inspector. Mr. Welsh was a most upright and conscientious examiner, and his popularity amongst teachers was proved by his being presented some years ago

with an illuminated address and a valuable tea and coffee service. The Lords of the Committee of Council on Education in Scotland have promoted Mr. John Galloway, Sub-Inspector of the Second Class, Dumfries and Kirkcudbright district, to be Sub-Inspector of the First Class *vice* Mr. Hugh Welsh, deceased. Mr. Thomas Allan Leishman, M.A., Glasgow University, has been nominated Sub-Inspector of the Second Class *vice* Mr. Galloway.

The late Mr. Balsillie. Few men in the teaching profession were better known or more highly respected than Mr. James Balsillie, M.A., Head English Master on the commercial side of George Watson's College, Edinburgh, who was lately cut off at a comparatively early age. He had been in failing health for the past year or two, and his death, though not altogether unexpected, will be very generally regretted. He was a keen and a good golfer, and on the links as well as in school he was exceedingly popular.

Jubilee of the Brechin Branch of the E.I.S. The Brechin branch of the E.I.S. has just celebrated its jubilee by a conversazione and dance, which passed off most successfully, thanks especially to the efforts of Mr. Robertson, Aldbar, the secretary. The meeting was largely attended not only by members, some of whom came from considerable distances, but by leading townspeople, including the Provost and others. Ex-Provost Lamb, Chairman of the Burgh School Board, in a humorous speech expressed his pleasure at being present and his good wishes for the welfare of the teaching profession. A most attractive programme was gone through during the evening, and dancing was kept up till an early hour in the morning.

Aberdeen Assistant Teachers' Association. The annual meeting of the Aberdeen branch of the Scottish Assistant Teachers' Association has just been held. The reports of the secretary and the treasurer showed that affairs in both of their departments were in a flourishing condition. The President, Mr. Anderson, in the course of a brief address congratulated the assistant teachers on having an organisation of such dimensions, and concluded by urging all assistant teachers to unite themselves with the Educational Institute. There was a higher ground for this, he observed, than what benefit they would receive, and that was what good they would do. Office-bearers were afterwards appointed, and some formal business transacted.

Mr. Jamieson, H.M.I. A conversazione was held the other evening in the Students' Union, Edinburgh University, in connection with the recent appointment of Mr. Francis R. Jamieson, M.A., as H.M. Inspector of Schools. Professor Hardie, whose assistant Mr. Jamieson had been, occupied the chair. About 180 ladies and gentlemen were present, and Mr. Jamieson was presented with a silver jardinière from his colleagues in the university. Mr. Hogge, who made the presentation, spoke of the great success of Mr. Jamieson as a Latin lecturer, and congratulated the educationists of the West upon securing so eminent an exponent of teaching as Mr. Jamieson.

Dinner to Mr. Lobban, H.M.I. A complimentary dinner has been given to Mr. A. Lobban, M.A., H.M.I., at Dingwall, on the occasion of his leaving the district for Banffshire. Sir Kenneth S. Mackenzie, Lord Lieutenant and Convener of the county, occupied the chair, and there was a large attendance of teachers and friends from all parts of the North. The chairman—who, by the way, is an Honorary Fellow of the Educational Institute of Scotland—proposed the toast of the evening in eulogistic terms, and, in the name of the Ross-shire branch of the E.I.S., presented Mr. Lobban with an illuminated address expressive of the members' regret at his removal from their midst, and their appreciation of the conscientious, able, and faithful manner in which he had discharged his duties during the seven years he had acted as H.M. Inspector for the district.

Honour to Mr. Dunn, H.M.I. The Senatus of the University of St. Andrews has resolved to confer upon Mr. George Dunn, M.A., H.M. Inspector of Schools for the County of Fife, the honorary degree of LL.D., and it will be very generally agreed, not only by the teachers in 'the kingdom,' but by the profession everywhere, that Mr. Dunn is eminently worthy of the honour. He is a man of quite exceptional ability as a scholar, and that in varied fields. An alumnus of Glasgow University, he graduated as B.A. of London, and later as M.A. of the same university, being awarded a gold medal in Classics. In modern languages Mr. Dunn is no less a master, while his ability in the field of English Literature and Philosophy is above that of the average man of education. It is even hinted that in such diverse lines as Musical Counterpoint and Hebrew he has been more than a dilettante student. As a writer of fiction, both solid and brilliant, Mr. Dunn has also made his mark. It only remains to be added that he is at the same time a first-rate examiner and a most genial and courteous gentleman. Would that all honorary degrees were as worthily worn as that of our good friend and *quondam* practical teacher, Dr. Dunn!

The Educational Ideas of the late Professor Huxley. At the last meeting of the Edinburgh branch of the E.I.S. Dr. Paterson, Rector of Moray House Training College, read a paper on 'The Educational Ideas of the late Professor Huxley.' There was an unusually large attendance of members. The lecturer expressed the decided opinion that the organisation and development of scientific education, so far as it had been attained in our time, owed much to Huxley's strong and well-defined views as to the place that education ought to occupy in school and university, to his clearness of vision as to the means and methods to be employed, and to his untiring energy and power of advocacy, which it was well-nigh impossible to resist. Dr. Paterson went on to speak of the yeoman service which Professor Huxley had done in the cause of the education of women. He also recalled the demand of the Professor that the elements of physical science should form an integral part of elementary education, and his well-known remark that to confine the education of a child to the three R's was to practise him in the use of the knife, fork, and spoon, without giving him a particle of meat.

Congress of Assistant Teachers' Association. The Scottish Assistant Teachers' Association held their first annual Congress in the University College, Dundee, on Saturday the 13th March. Mr. John Ritchie, Aberdeen, Convener of the Central Executive of the Association, presided, and there was a very large attendance of delegates, members, and others, including many ladies. The President in his opening address dealt particularly with the subject of the organisation of teachers in Scotland. He traced the rise of the Assistant Teachers' Union in Scotland, and concluded with an appeal to all assistants to become members of the Association. Mr. Dickson, Edinburgh, dealt with the question of 'Evening Continuation Schools' on the lines of his paper formerly referred to in these pages, and his address was followed by a resolution recommending that evening schools should meet only three nights weekly. The next paper was by Mr. Fenton, Aberdeen, and its title was 'Influence of Assistant Teachers on Education.' He pointed out that the assistant teacher who was face to face with his pupils for some thirty hours a week could not fail to exercise great influence over their manners and their character generally. A teacher, fully conscious of this, would see to it that this influence was of the best possible kind. He held that there ought to be no hard and fast line between elementary and secondary schools, for, if they were to kindle a desire for higher culture in the breasts of the young, the spark must be lit in the elementary schools. Mr. Robb, Kirkcaldy, in moving that it was desirable in the public interest that the status and emoluments of assistants should be such as to induce men of ability and high character to enter the profession, contended that teachers should be in line with ministers, lawyers, and doctors. The Congress dinner was held in the afternoon, and was largely attended. On the Friday evening there was a conversazione and dance under the patronage of the Lord Provost, and this function also passed off most successfully. Altogether, the assistant teachers are to be congratulated on the success of their first Congress.

CLASS LESSONS IN DOMESTIC ECONOMY.

BY ETHEL R. LUSH.

Author of 'Chats with Children on Domestic Economy,' Head Mistress of the Ipswich Higher Grade Girls' School, and Organising Mistress to the Ipswich School Board.

Lesson VIII.

STANDARD IV.

CLASSIFICATION OF FOOD: FLESH FORMERS.

[*Apparatus required.*—An egg, milk, lean meat, wheat flour jellies, isinglass, rennet or vinegar, spirits of wine, test-tubes and spirit lamp or Bunsen burner.]

In our last lesson you heard of the various tissues of the body, and how they differ from each other in construction. It follows, therefore, that the material we use to build up and repair the waste of these tissues must be of various kinds, for we do not patch a print pinafore with silk, nor a velvet gown with woollen. Thus, among the foods which form our diet we need some to form flesh, others to build up bone, others, again, to make fatty tissue and to supply heat. Although we do not exactly repair muscle with muscle, bone with bone, fat with fat, and so on, yet the foods we take for these purposes have a similar composition to the tissues. For example, flesh-forming foods are made up of the same elements as flesh, and bone-forming foods, when reduced to their elements, are identical with those of bone.

The classification of foods naturally bears a close resemblance to the composition of the body, for we have a very important class of foods known as flesh-formers or *nitrogenous foods*, which, as their name implies, build up muscular tissue; an almost equally important class called *fats*, whose principal use is to give heat and furnish force; a third class distinguished by the long name *carbohydrates*, but which you may call starches and sugars—these, too, give heat; a fourth class, *mineral salts*, which build up all the hard parts of the body, such as bones and teeth; and, lastly, *water*, which keeps the blood and digestive juices fluid, and makes good the large amount of water we lose daily.

I have so far given you only the chief use of each class. Flesh-formers have three additional uses—they give heat, help to form the digestive juices, and are useful in connection with the absorption of oxygen.

Fats play a very important part in the work of the body; they aid digestion—codliver oil is particularly useful in this respect—they assist excretion, witness the effect of castor-oil, and when more fat is eaten than is used in producing heat the excess is stored up in the body to preserve such delicate organs as the eye and kidneys from injury, and to serve as a reserve force for a time of need—a kind of insurance against starvation.

Mineral salts not only build up the bones, teeth, hair, and nails, but enter into the composition of the blood and digestive juices, and so important is this branch of their work that if we were deprived of them altogether we should first suffer from poorness of blood and diseases of the skin, and eventually we should die. Now that you know the work or functions of the various kinds of foods we eat, we will look more closely at their nature. Let us begin with the *flesh-formers*.

I will take a hen's egg and break it into a saucer. We are not at present concerned with the yolk, so I will remove it and ask you to concentrate your attention on the transparent sticky liquid which we call *white of egg*, or *albumen*, from the Latin word *albus*, meaning white. It is from this albumen that the body of a chicken is formed, hence you will readily understand that white of egg is a flesh-forming food. If you watch while I hold a test-tube containing albumen over a spirit lamp you will shortly see that the transparent fluid is hardening into a solid white substance, and the longer I boil it the harder it will become. You have noticed that roast and baked meats have always a hard shiny exterior; this is owing to the albumen contained in meat, which, under the influence of heat, has hardened just as that in the test-tube did.

Milk is another food which Nature provides for the sustenance of the young. Here is a little new milk in a test-tube. I add to it an acid, known as rennet, with the result that the milk separates into two parts—a solid curd and a liquid. This creamy white substance is the flesh-former in milk, and from it the young of all animals build up their bodies.

Lean meat contains another flesh-former besides albumen. Notice its red colour, owing, of course, to the blood it contains. I will wash the meat in water until all the blood has left it, and then put a small piece into spirits of wine. By these means we shall obtain a mass of whitish fibres which constitute the flesh-forming portion of meat, and are collectively known as *fibrin*. Though I have only spoken of meat, fibrin is also contained in the flesh of fish, poultry, game, etc.

It may astonish you to find that *bones* yield a valuable flesh-former. I have here a sample of water in which bones have been boiled. Observe that it is quite solid, a jelly, in fact. If now I heat it over the flame of my spirit lamp it will become fluid again. A piece of jelly, cut from one of the table jellies sold by the grocer, is reduced to a liquid in a similar way. Both of these liquids will become solid again on cooling. This little experiment shows us that *gelatine*, the substance composing jellies, is derived from bones by boiling.

Isinglass, which you may buy from the chemist, is nearly pure gelatine. It is obtained from the floating bladder of the sturgeon.

A gelatinous substance called *chondrin* is yielded by gristle or cartilage.

All the foregoing flesh-formers are derived from animals. The two we speak of next are vegetable substances.

Here is some *wheat flour* which I am about to tie up in a muslin bag. By squeezing this bag of flour in a basin of water for some time a large portion of the flour is washed away, the water in the basin becomes quite white, and the bag is found to contain a greyish sticky substance which we call *gluten*. This is the flesh-forming substance of wheat. By its means we are enabled to make bread from wheat flour. If, now, I add a few drops of iodine to a portion of the milky contents of the basin we shall find that the colour changes to blue, proving without doubt that starch is present in flour. But of this constituent we shall hear more presently.

Albumen, too, is found in wheat and other cereal grains. This we may prove by filtering some of the milky fluid in the basin and then boiling the clear liquid, when it will turn white and opaque.

In *beans*, *peas*, and *lentils* we find a flesh-forming substance which so strongly resembles casein as to be sometimes called *vegetable casein*: it is more generally termed *legumen*, however. This food substance has a very high nutritive value, but it requires thorough cooking to render it digestible. It will help you to remember its similarity to casein to know that the Chinese make a kind of cheese from peas.

We may classify these flesh-forming food substances in another way.

Albumen, fibrin, casein, gluten, and legumen are so much alike in their general composition that they are all termed *protein compounds*, or *albumens*. Gelatine and chondrin resemble each other, and are classed together as *gelatinoids*.

The albumens have the greater value as food substances, but the gelatinoids are useful because of the ease with which they are digested, and for this reason jellies are popular for invalids.

SUMMARY.

Classifications of Foods:—

1. Nitrogenous or flesh-forming foods.
2. Fats.
3. Carbohydrates, including starch, sugars, and dextrine.
4. Water.
5. Mineral salts.

Uses of each class:—

Nitrogenous foods (*a*) form flesh, (*b*) give heat, (*c*) aid in the formation of digestive ferments, (*d*) promote the absorption of oxygen.

Fats (*a*) give heat, (*b*) aid digestion, (*c*) aid excretion, (*d*) act as a reserve force, (*e*) protect delicate organs in the body.
Carbohydrates give heat.
Water (*a*) maintains the fluidity of the blood and digestive juices, (*b*) assists excretion, (*c*) enters into the composition of all the tissues.
Mineral salts (*a*) form bones, hair, teeth, and nails, (*b*) aid in the formation of the blood and digestive juices, (*c*) serve to purify the blood.

Flesh-forming substances :—

Albumens : *Albumen* found in white of egg and lean meat, *fibrin* found in lean meat and fish, *casein* found in milk and cheese, *legumen* found in beans and peas, *gluten* found in all cereals.
Albuminoids : Gelatine obtained by boiling bones, chondrin obtained from cartilage.

OUR FRENCH PRIZE COMPETITION.

Prize Editor.—W. T. THOMPSON, B.A. (LOND.),
First Class French Honours.

PRIZE AWARD—MARCH.

The Prize is awarded to *Rule Britannia*, the pseudonym of G. A. GREEN, Villa Duvert, Mentone, France.

First Class.—Sic, Philosophe, Glanage, Defence, Windsor, Joppa, East Anglia, Aquinas, Koorali, Olivia, Albion, Beth, A reader of the PRACTICAL TEACHER, Girdleness, St. Brelade, Arc de Triomphe, Pelican, Black Douglas, Phaidimos, Galatea, Abonné, Arbor, Echo, Romola, Langcliffe, Verus, Jersiais, Désirée, Zimbabwe, Samarobriva, Alexis, Moness.

Second Class.—Cerdic, Derby, Tizza, Oisin, Max, Perthshire, Kettering, Gainsborough, Spes, Benin, Legiolium, Rosebud, Blue Violets, Courage, Renllek, Dunedin, Boadicea, Iseult, W. M. E., Friar Tuck, Maid Marian, E. S., Sam, Stigand, Pimpernel, Paris, R. F. and N. D., Patience, Semper Eadem, Wellingtonia, Nil Desperandum, Berwick.

Third Class.—Nina, Anglaise, Daisy Gerard, Aurora Borealis, Throstle Nest, Imsraif, Madelon, Bristolian, J., Heath, Football, Pedagogue, Un commençant, Highgate, Espoir.

Too late for Classification.—Weary Wobbler, Jupiter, Nunquam Obliviscar, May, A New Contributor.

Ce Paris, elle ne le regretta pourtant pas, bien sûr, quoiqu'il y eût là beaucoup de choses belles et amusantes. D'abord, elle s'y trouvait presque à l'étroit ayant dans les veines ce sang des coureurs de mer. Et puis, elle s'y sentait une étrangère, une déplacée : les Parisiennes, c'étaient ces femmes dont la taille mince avait aux reins une cambrure artificielle, qui connaissaient une manière à part de marcher, de se trémousser dans des gaines baleinées : et elle était trop intelligente pour avoir jamais essayé de copier de plus près ces choses. Avec ses coiffes, commandées chaque année à la faiseuse de Paimpol, elle se trouvait mal à l'aise dans les rues de Paris, ne se rendant pas compte que, si on se retournait tant pour la voir, c'est qu'elle était très charmante à regarder.

Il y en avait, de ces Parisiennes, dont les allures avaient une distinction qui l'attirait, mais elle les savait inaccessibles, celles-là. Et les autres, celles de plus bas, qui auraient consenti à lier connaissance, elle les tenait dédaigneusement à l'écart, ne les jugeant pas dignes. Elle avait donc vécu sans amies, presque sans autre société que celle de son père, souvent affairé, absent. Elle ne regrettait pas cette vie de dépaysement et de solitude.

PIERRE LOTI.

Translation.

Still, she certainly did not regret leaving Paris, although there was much that was beautiful and amusing there. In the first place, she felt almost cramped in the city, for roving sailor's blood flowed in her veins. Then, too, she felt a stranger there—out of her element. Parisians to her meant women whose slender figures showed an artificial curve at the hips ; women who had a way of their own of walking and fluttering about encased in whalebone : and she was much too intelligent ever to have tried to imitate such things. She felt ill at ease in the streets of Paris with her Brittany caps, which she ordered every year from the Paimpol milliner ; for she did not realise that people turned round so often to look at her simply because she herself was a very charming sight.

Amongst those Parisians were some whose refined bearing attracted her ; but she knew *they* were inaccessible. Those of a lower class, who would have consented to fraternise with her, she kept haughtily at arm's length, not deeming them her equals. She had thus lived without friends, almost without any other society than that of her father, who was often busy and absent. She did not wish that life of exile and solitude back again.

RULE BRITANNIA.

The extract set was perhaps somewhat less difficult than the average, but there were many failures to render correctly phrases the meanings of which should have been obvious. Thus *à l'étroit* was rendered 'short of room,' 'in a fix,' 'next to the Strait,' 'in difficulties,' 'on the brink of poverty.'

The most prevailing fault was a want of freedom in translation. Some candidates would improve their translations if they studied the piece carefully as a whole, in order to get its general drift, before committing anything to paper.

The *Ce* in *Ce Paris* is idiomatic, and should not have been translated. Some candidates translated *il y eût* after *quoique* as 'there might be,' forgetting that *quoique* governs the subjunctive. *Coiffes* was a difficulty to some. It refers to the peculiar head-dress worn by Breton women. *Amies* in the last line but two was more exactly and correctly rendered by several competitors as 'friends of her own sex.'

APRIL PRIZE COMPETITION.

A Prize of One Guinea will be given for the best translation into English of the following extract :—

A Plaisance, le 30 mai, 1804.

Nous venons de faire un empereur, et pour ma part je n'y ai pas nui. Voici l'histoire. Ce matin, d'Anthouard nous assemble, et nous dit de quoi il s'agissait, mais bonnement, sans préambule ni péroraison. Un empereur ou la république, lequel est le plus de votre goût ? Comme on dit rôti ou bouilli, que voulez-vous ? Sa harangue finie, nous voilà tous à nous regarder, assis en rond. Messieurs, qu'opinez-vous ? Pas le mot. Personne n'ouvre la bouche. Cela dura un quart d'heure ou plus, et devenait embarrassant pour d'Anthouard et pour tout le monde, quand Maire, un jeune homme, un lieutenant que tu as pu voir, se lève et dit : S'il veut être empereur, qu'il le soit ; mais, pour en dire mon avis, je ne le trouve pas bon du tout. Expliquez-vous, dit le colonel ; voulez-vous, ne voulez-vous pas ? Je ne le veux pas, répond Maire. Nouveau silence. On recommence à s'observer les uns les autres, comme des gens qui se voient pour la première fois. Nous y serions encore si je n'eusse pris la parole. Messieurs, dis-je, il me semble, sauf correction, que ceci ne nous regarde pas. La nation veut un empereur, est-ce à nous d'en délibérer ? Ce raisonnement parut si fort, si lumineux, que j'entraînai l'assemblée. Jamais orateur n'eut un succès si complet. On se lève, on signe, on s'en va jouer au billard. Maire me disait : Ma foi, commandant, vous parlez comme Cicéron ; mais pourquoi voulez-vous tant qu'il soit empereur, je vous prie ? Pour en finir et faire notre partie de billard. Faillait-il rester là tout le jour ? Pourquoi, vous, ne le voulez-vous pas ? Je ne sais, me dit-il, mais je le croyais fait pour quelque chose de mieux. Voilà le propos du lieutenant, que je ne trouve point tant sot. En effet, que signifie, dis-moi, un homme comme lui, Bonaparte, soldat, chef d'armée, le premier capitaine du monde, vouloir qu'on l'appelle majesté. Etre Bonaparte, et se faire sire ! *Il aspire à descendre ;* mais non, il croit monter en s'égalant aux rois. Il aime mieux un titre qu'un nom. Pauvre homme, ses idées sont au-dessous de sa fortune. Je m'en doutai quand je le vis donner sa petite sœur à Borghèse, et croire que Borghèse lui faisait trop d'honneur.

PAUL LOUIS COURIER.

RULES.

1. All translations should be posted not later than April 10, and addressed :—*Prize Editor*, Office of THE PRACTICAL TEACHER, 33, Paternoster Row, London, E.C.
2. Competitors should cut out, and send the Coupon which appears on the Back Wrapper page of the current number.
3. Competitors should adopt a pseudonym, and send name and address written on a separate piece of paper.

Professor Darqué's French Course has been used by Teachers who have 'topped' the Scholarship Examination. The Professor of Literature at the Lycée, Versailles, writes :—'Le plan général de l'ouvrage me paraît excellent ; enseigner par la pratique plutôt que par la théorie me paraît la voie la plus rapide et la meilleure.' Her Majesty's Inspectors have, in all parts of the country, freely testified to the excellence of Prof. Darqué's French Course, especially as to its fitness for Pupil Teachers' use. May be had post free from the PRACTICAL TEACHER Office, for 2s.

INTERNATIONAL CORRESPONDENCE FOR TEACHERS.

LEARNING LANGUAGES BY LETTER WRITING.

THE scheme which was described in the March number of THE PRACTICAL TEACHER has been cordially welcomed by a large number of our readers, and the response to the request with which our article concluded—that teachers desirous of sharing the advantages of the International Correspondence would send names to our office—has been very encouraging.

One of our correspondents says he has long 'wished to correspond with a French teacher, and made many fruitless attempts to do so by making inquiries of various editors.' Another says 'Such a scheme ought to be productive of good results, and comes as a blessing to teachers like myself, who are so far removed from the heart of things.'

A third, in more glowing terms, says he thinks 'the announcement of the scheme should be put down among the great thoughts of the century'; and that 'all in any way interested in the study of the French language owe a great debt of gratitude to him with whom the idea started, and to those who have so heartily taken it up.'

Yet another says of the plan, 'It is really of very great educative value, and deserves all that was said of it in your last issue.' Indeed, its advantages seem to be very generally recognised, and in the letters we have received the changes are freely rung on the words 'capital,' 'admirable,' 'excellent' as epithets to characterise the scheme.

For all these expressions of approval and for the many compliments and good wishes for the success of our journal which our correspondents have kindly mingled with their commendation of the scheme, we desire to return our cordial thanks. We venture to add that we are anxious and shall earnestly endeavour to deserve such kindly appreciation, whether our readers find opportunity of expressing it or not.

M. MIEILLE AND FAMILY GROUP AT DRAGUIGNAN.

The *Revue Universitaire*, in which the first exposition of the scheme was suggested for pupils of schools, appears, like the *Review of Reviews*, mid-monthly, and the February number did not reach our hands until our own paper was in type. In that number the editor returned to the subject and opened his leading article with this statement:—

> 'L'idée d'une correspondance scolaire internationale a obtenu un succès que nous n'aurions pas osé prevoir. La presse entière l'a accueillie avec une sympathie dont nous avons été infiniment touchés: les journaux de toutes les opinions, et les plus considerables, les plus lus, l'ont exposées avec de grands détails et l'ont approuvées sans réserve.'

He goes on to quote at length many passages of appreciative comment from such journals as the *Temps*, the *Annales Politiques et Littéraires*, the *République Française*, *La Liberté*, *Le Figaro*, and others.

Further pages of the *Revue Universitaire* contain the first lists of scholars paired for correspondents. Our readers must remember that so far in France the idea has only been specially advocated for pupils of schools.

From M. Mieille we received a very interesting letter from which we take the liberty of making quotation. After saying some kind things about our journal, and expressing his pleasure at being informed of the welcome given by the teachers to the proposed International Correspondence, he proceeds:—

> 'It is through the teachers that we have the greatest chance of building up our scheme on a serious and solid basis. Boys are naturally lazy and disinclined to write: they must be, I do not say compelled, but encouraged and stimulated by their natural guides the teachers; and if once we get the latter to co-operate with us, the former are safe.
>
> 'I have been told and am told again by several English friends that the average English boy *won't* write—that I can't expect this same average English boy to write to foreigners while he scarcely ever does to his parents, relations, or friends.
>
> 'To this I answer—
>
> '1st.—The more is the need then for your average English boy to enter our correspondence scheme. Letter-writing, be it in the mother or a foreign tongue, is the best means of cultivating and acquiring a perfect use of a language. Better a nice, free, out-spoken letter than all the so-called essays, narrations, and compositions.
>
> '2nd.—I cannot quite believe in that abhorrence of your boys for letter-writing. They are sensible enough not to be fond of writing when they have nothing to write about, and they hate (quite right, too!) all sentimental, soft, "humbuggish" prattle, and who can blame them if they do? But let them be shown how interesting our International Correspondence may become, let them be persuaded that it is the best practical way of learning to write French with ease, and then see if they will not put to shame all the wise Thomases in the world.

'I earnestly hope THE PRACTICAL TEACHER will do much in persuading the teachers of all orders that the success of the thing rests in their hands. It is for them to lead, the boys will follow right enough.'

With this letter M. Mieille sends us a photograph, a reproduction of which may interest our readers. It represents a family group in which M. Mieille is standing, with his wife, Madame Mieille, seated to his left, and his sister to the right with their children. Both ladies are teachers.

In the current number of the *Review of Reviews*, Mr. Stead reports the progress of the scheme; and at present there seems to be a want of balance in the responses received from French and English boys respectively. That, however, must be put down in part to the fact that the appeal was made in France a month before it was in England. Possibly, also, our neighbours across the Channel may be a little quicker to seize an idea than the generality among ourselves.

With regard to the application of the scheme to teachers, the conditions just referred to are reversed. The public presentation of this expansion of the idea has not yet, as far as we are aware, been made in France. Hence we have to ask our readers who are eager to enter on their course of mutual instruction by letter-writing to exercise a little patience until the arrangements can be made for a supply of foreign correspondents. At present, M. Armand Colin seems to have his hands pretty full with the arrangements for school-children, especially as the scheme is being arranged for the benefit of children in German schools.

It will no doubt be readily seen that there must be some delay, but for ourselves, and we can speak also for M. Mieille and for Mr. Stead, we will endeavour to abridge that delay as much as possible, so as to get the scheme in actual operation.

According to the plan likely to be carried out, the English correspondents may expect to receive their first direct intimation of the beginning of the correspondence in the form of a letter written in French by the French teachers with whom they are respectively paired.

In order to secure the maximum of advantage to those who enter the lists, it is, of course, desirable that the pairs shall be arranged with some judgment. To this end, would-be correspondents are requested to give with their name and address the title, as Mr., Mrs., or Miss, and also some indication of their age. In this way it may be easier to secure that between those who have to correspond with each other there should be sufficient community of interest to make the scheme work smoothly and advantageously.

We trust that in our next issue we may be able to announce decided progress in the arrangements, and later on we may hope to be enabled by the kindness of our friends to publish some specimen letters, and so make the scheme more widely appreciated and of more general advantage.

EDUCATION DEPARTMENT.

MANUAL INSTRUCTION CENTRES.
BUILDING RULES.

My Lords have had under consideration the question of the construction and situation of rooms for Manual Instruction in connection with public elementary schools.

They find that these rooms have often been built on sites originally approved only for ordinary school accommodation, and that the open playgrounds have thereby been reduced in size, and the sources of fresh air supply to the schools have been injured, in violation of the principles laid down in the Building Rules (*see* Rule 15, Schedule VII., New Code).

They consider that the following rules should be observed:—

1. Manual Instruction should not be given in the class-rooms of the school.

2. A room to be used for Manual Instruction need not be on the same site as the school to which it is attached.

3. A room to be used for Manual Instruction should not be built on a site already occupied by the playground of a school, unless it can be so built that the school continues fully to fulfil the conditions of Building Rule 15, as to uncovered space, and that the supply of fresh air to the school is not impeded.

4. The plan, arrangements, construction, lighting, and ventilation of the room should be those suitable for a workshop rather than those suitable for a school.

The construction should accordingly be simple. The roof may be either of lean-to, or other ordinary form, according to circumstances. Its height at the windows in front of the benches need not be more than ten feet. The light must be ample. The temperature should not be so high as in an ordinary class-room. A flat ceiling is not as a rule necessary. The ventilation should be ample by inlets at a height of five feet from the floor, and by outlets at the highest point.

Their Lordships are informed that satisfactory buildings can be provided at a cost of 10s. per superficial foot, and that the maximum cost ought never to exceed 15s.

PUPIL TEACHER EXAMINATIONS.

Circular 203.

SCOTCH EDUCATION DEPARTMENT,
10th March 1897.

SIR,

I am to point out that only *two* examinations of Pupil Teachers and Candidates at the end of the second year will be held after April this year, namely, one on the last Saturday of October for those serving in October, November, December, January, February, March, and April Schools, and the other on the last Saturday of April for those serving in May, June, July, and August Schools.

The indentures of those attending the October examination will date from the 1st December; of those attending the April examination from the 1st July.

I have the honour to be,
Sir,
Your obedient servant,
H. CRAIK.

To

The Clerk of the School Board, *or*,
The Official Correspondent of the School.

THE PROPOSED NEW INSTITUTE FOR TEACHING BOTANY.—The Council of the Royal Botanic Society is proposing to establish an Institute for teaching botany in London. Their Botanic Gardens have at present a museum, lecture theatre, and a small library and herbarium, which might form the bases of larger collections in connection with the proposed institute. In doing this they would not be covering the same ground as the Imperial Institute and the Botanic Gardens at Kew. The former undertakes the investigation of products only, not practical botany and the study of plant life. At Kew there is only room for trained workers. A special function of the Institute would be the teaching of vegetable physiology, the study of living plants and the working of a physiological laboratory for botanical investigation to aid and to meet the practical requirements of the colonist, the agriculturist, the gardener, and the merchants who deal in tea, coffee, tobacco, timber, drugs, and vegetable products only. The need of a Botanical Institute for these purposes is felt by colonists and intending emigrants who now go to Germany in considerable numbers to obtain instruction. The functions of the Institute would be on the purely scientific side, the practical teaching of botany and the encouragement of botanical research. On the economic and technical side it would undertake the diagnosis of the diseases and parasites of plants, the estimation and value of timbers and their selection in regard to resistance to strain, moisture, and decay; the study of vegetable fibres, their strength, fineness, and the methods of cleaning and preparing them for a commercial point of view, the methods of separating and gathering indiarubber and guttapercha, and collecting them as free from extraneous matter as possible; and the same in regard to gums, resin, and drugs. The study of grasses and cereals, cruciferous and leguminous plants would be designed for the guidance of agriculturists, and that of horticulture for the gardener and fruit-grower. Eventually the Council hopes, if the Institute is founded, it will become affiliated to the London University, and be recognised as one of the teaching schools in connection with the reconstructed University.

OUR ART SECTION.

BY J. VAUGHAN,

Art Master, and Organising Teacher of Manual Training, School Board for London.

INDUSTRIAL DRAWING IN ELEMENTARY SCHOOLS.

III.

A SINGLE glance at the accompanying illustrations will show that they are somewhat in advance of those given last month. Yet not too much so, I hope, for the average child. The lines composing Fig. 1 are exactly similar to those in Figs. 5 and 6 of last month, viz., diagonals of a square; but note that now they start from the *centre* of the side of a square, and not from the end. Small as this seems, it is really a considerable step in advance for little children. The centre must first be found. Now, I would have this done by judgment only; do not have any attempt at measuring, but train the eye to judge at sight. First, easy distances, as the centre of a short line; then gradually increasing the length and taking thirds, etc. The present exercises only involve dividing a line into two equal parts.

Since I wrote the last article it has been my good fortune to hear an eminent R.A. lecture on Art Teaching in Schools. Naturally he advocated doing away with all copying from the flat, and would draw from the round at once. He would also do away with all aids, and let the pupil draw straight away what he sees. But he frankly admitted that it would be folly to pursue this method with a class of sixty or more children. He would first eliminate all those who had no natural capacity for drawing, and take only those in whom the artistic germ existed. I fixed this as five or ten in a class of sixty, but I was probably over the mark. Further, he said that the children in an elementary school were perhaps rather too young to try this method at all; their faculties were only just awakening, and could not be put to such a severe test.

Personally I was extremely glad to hear this expression of opinion, because with regard to the teaching of drawing, the artistic idea, and the educational idea, seem so much opposed to each other. The former assumes that the natural artistic capacity exists in every child, and bases its methods of teaching on this assumption. I sincerely wish it did, but my own practical experience teaches me otherwise. We have to begin by trying to plant the germ—oftentimes in a soil which is not at all favourable. That is why it is so necessary to give support until the growth is sufficiently strong to support itself. No man would employ a small stake to hold up a full-grown oak; but unless he supports his sapling he is likely to get no tree at all. Therefore it seems to me that we shall have to be content to go on using such aids as we feel the children need. I am, however, strongly of the opinion that we can do much more to cultivate the artistic instinct than is often done at present, and, as I have said before, I thoroughly believe that every one can be taught drawing with a fair measure of success.

In practical work the pencil drill must still be continued, until lines can be drawn in any direction rapidly and fairly well. Take five minutes of this at the commencement of the lesson.

For Fig. 1 first divide the side of each square into two equal parts, and join the points by the oblique lines. Next fix the position of the centre dot and the four surrounding ones. Put in the lines to connect them, and then shade the triangular spaces.

Fig. 2 is very similar to Fig. 3 last month, but another square is introduced. Mark the centre of each side of the square, as shown at the left, judging by sight only. Join the four points. Now place a dot in the centre of the next square and put in the diameters. Shade the triangles in one square and put in the diagonal lines in the other.

Lines rather more than two inches long are introduced into Fig. 3, but we still only divide spaces into two equal parts. Commence by drawing the square. Divide the sides as shown, and join the points. These lines are much more difficult than any we have yet attempted, and it will require very great care to make them cross at the centre, which is really the best test of accuracy.

Fig. 4 needs lines three inches in length. Draw the rectangle first, and find the centre of each side. Join these points, and then put the diamond shape in the centre.

I hope soon to be able to suggest another way of developing the spaces beside using the parallel shade lines.

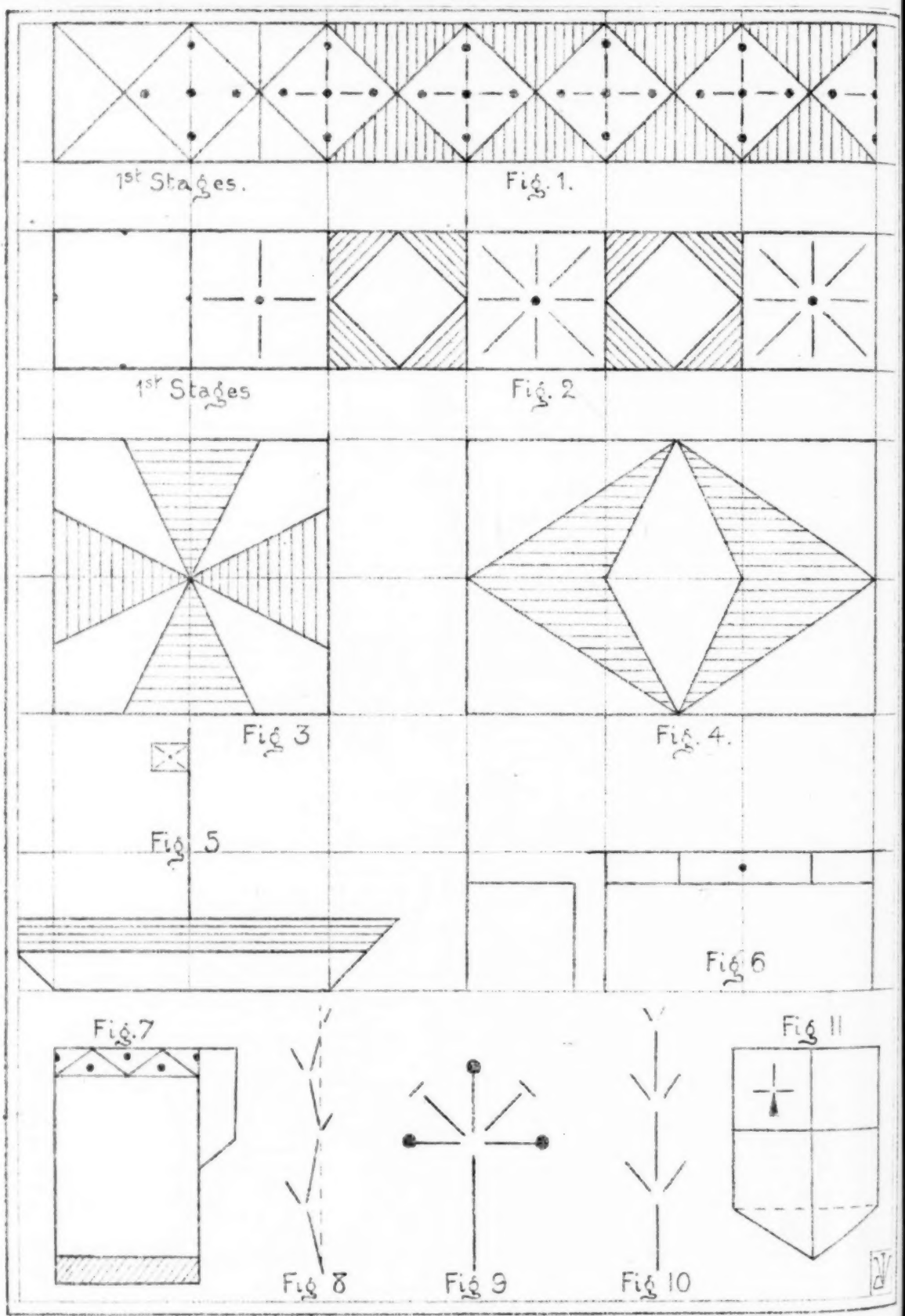
Figs. 5 and 6 are simple forms adapted to squared paper. You will notice that they do not conform to the lines so rigidly as the previous exercises, and here again we make progress.

Start the boat by marking the centre of two squares—having two spaces between them. Join these two points—the line being three inches long. Now draw the bottom line and the sloping lines at stem and stern to complete the hull. Next add the mast with its little flag.

In Fig. 6 draw the top of the table first, then the legs. Next draw the back of the chair, which is one-and-a-half squares high. Divide this line into two equal parts, and from this centre point draw the seat of the chair; then the leg, making this lower portion form a square. Now draw the lower edge of the table, and mark the position of the drawer. This exercise is adapted from that given in the Illustrated Syllabus, and is a very interesting one.

The remaining exercises are all to be drawn to as large a scale as possible on plain paper. In these, of course, the proportion should be judged at sight from the teacher's drawing on the board. In Fig. 9 draw the rectangle first, and then the handle. The ornamentation is not really difficult, and adds very greatly to the interest of the work. If possible, have a real mug to take the proportions from.

Figs. 8 and 10 are simply skeleton sketches of twigs, and may be done more for the sake of imparting information than for the drawing. They show the difference between two classes of twigs, viz., those on which the buds grow on alternate sides of the twig, as lime, hawthorn, etc., and those which spring directly opposite to each other, as privet, lilac, etc. Let the children notice the difference in the shape of the



INDUSTRIAL DRAWING, FIRST STAGE.—Simple right-lined exercises which demand the division of a line into *two* equal parts only.

twig due to this. Drawing may often be advantageously connected with lessons of this kind; it serves to fix the facts on the mind.

Fig. 10 is a simple rendering of a tuft of berries. Fig. 11 a simple shield shape. Draw a rectangle first, and divide each side into two equal parts. Join the lines, and continue the vertical one sufficiently far below to make the tapering portion.

In order to give more illustrations, now that the method is clear, I will draw the figures to half scale in future. I shall be very glad of any suggestions which will render these papers more helpful.

ART PICTURES FOR THE WALLS OF SCHOOLROOMS.

In any complete practical scheme of education on rational lines place must be found for the training of the imagination and the development of taste. In other words, in all our schools, primary and secondary, the importance of art-teaching and art-influence in some form or other must be recognised. As a matter of fact, this is already the case to a large extent, though the suitability and reasonableness of some of the modes actually encouraged and adopted may be open to question. Still, the general requirement in our elementary schools of some simple sort of art-teaching in the form of drawing, brush drawing, colour work, modelling in cardboard and clay, or any other of the modes of what is called Hand and Eye Training is a sign of the practical recognition of the importance of early art training.

There are, however, besides these simple forms of direct teaching, other ways in which the training of the eye to see, and of the spirit to delight in what is beautiful, can be materially helped. Rich men, possessed not only of wealth but of an appreciation of beautiful things, have in many cases set themselves to make valuable collections of works of art; and then, moved by the desire that fortunately so often accompanies the love of art, the desire, namely, that others may share in the delight it brings, have given or bequeathed part or the whole of their art treasures to be the property of the nation or of the municipal authority of their locality. As instances of this, witness the collections housed at South Kensington and in the National Gallery, and also the remarkable, almost priceless, collection of works of art which belonged to the late Sir Richard Wallace.

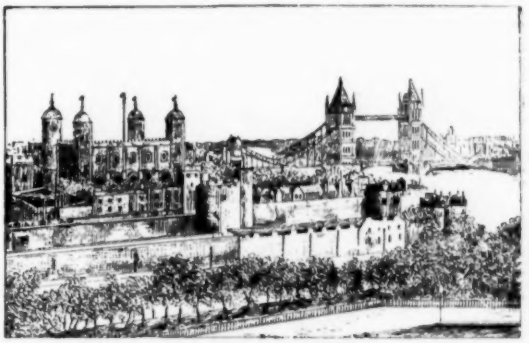
Municipal bodies, as well as the nation, have also acquired beautiful pictures and other works of art at great cost for the benefit of the citizens, whose welfare it is their duty to promote. Everyone will admit that it is desirable that the rising generation may be able to appreciate these priceless treasures, to the inheritance of which they are called. It is in school while they are children that they can best enter upon the needful course of training. And as we have already indicated, such course must not be confined to the simple elementary artistic or quasi-artistic operations which children may be able to perform under the direction of their teachers. It is important that they should have some artistic works constantly around them.

The Education Department have made a wise departure in the recognition of visits of school children to picture galleries and museums as a suitable form of useful lesson. But this visiting of galleries, valuable as it can be made, can only be occasional, and is not likely to be shared in by the bulk of the scholars. It is desirable, further, that the schoolrooms should themselves contain good pictures to form a part of the education afforded within them. This point also, we rejoice to know, is widely admitted. Most of the Board Schools in London and in our large urban centres have the walls hung with pictorial decorations, often fine engravings and etchings. One school we well remember has a hall with no fewer than a hundred pictures on its four walls—many of them large engravings and etchings framed and glazed.

Such pictures, however, if they are of good artistic quality, and of size sufficient to be suitable for the walls of a large hall, are costly; and it would be found a serious matter to furnish many schools with them. One object of this paper is to call attention to certain series of pictures by selecting from which managers will find it possible at moderate cost to provide abundance of artistic wall decorations of admirable character.

The first set to claim notice is a series of large photographs published under the title of the 'A. L.' Photographs, by MESSRS. E. J. ARNOLD AND SON, of LEEDS. For these pictures very large negatives have been specially taken, and still larger reproductions made from them. Each finished photograph is of the size 17 inches by 22 inches, and is mounted on a surface 25 inches by 30 inches, that is with a margin of four inches. The series is intended to include about fifty pictures, of which thirteen are now ready. Owing to the extreme pains taken to overcome the difficulty of securing sufficiently large negatives for the purpose in view, the work of producing these thirteen pictures has occupied over two years.

It may perhaps surprise some of our readers that we should refer to photographs as artistic pictures likely to assist in giving children a sound art-training; but we think their surprise would cease or altogether change its direction if they could see the three beautiful specimens on which we base our observations. The fact is that photography has passed from the stage when it could be regarded as a merely mechanical process. It still has its limitations; but there is room for the exercise of the artist's eye in the choice of a point of view, in watching for the most favourable conditions of light and atmosphere, and for the artist's hand in finishing the plates so as to produce the most pleasing effects. Since beginning this paper we have had the good fortune to hear Professor Herkomer give a lecture on Art-teaching, and one condition he laid down for successful teaching was that the students should have around them photographic reproductions of the works of the great masters.



REDUCED SPECIMEN OF THE 'A.L.' SERIES.

But to return to the pictures before us. One represents *The Castle of Chillon*, another *Cologne Cathedral*, and the third *The Tower of London and Tower Bridge*. The last is especially interesting because we have some particulars about its production. It was taken, by special permission, from the top of the Mazawattee Tea Company's Warehouse, whence could be obtained a comprehensive view of the Tower and its defences and the gardens, and of the whole length of the Bridge and its approaches. Thus we have in one picture a capital illustration of the old and the new in building and engineering; on the one hand the most ancient, perhaps, of London's public buildings, and on the other, one of the greatest and most recent of the modern triumphs of industrial art. As evidence of the extreme care of the publishers to make their productions as perfect as possible, we may state that our copy of this photograph, though we have detected no fault in it, is stamped as 'cancelled.' Three different negatives, we understand, have been rejected as not fully up to the standard aimed at, and all the copies have been cancelled on account of some small mechanical defect.

The picture of the *Castle of Chillon* gives a charming view of Lake Geneva, with the serrated ridge of the Dent du Midi in the distance. The wonderful colouring of the Alpine region is, of course, wanting; but those who have spent happy days in such scenery can draw upon their memory and

imagination, and clothe the lake with its shimmering blue, tip the snowy peaks with roseate glow, fill the sky with limpid azure, and the deep hollows with purple gloom. For the scholars, who are not likely to have shared in such delights, the teachers who have, may make such pictures the theme of an exercise in developing artistic perception and imaginative faculty.

The picture of *Cologne Cathedral* is a particularly bright one, and besides the glorious pile of Gothic architecture, it shows other great buildings of the city, the great church of St. Martin being a prominent object. An excellent view of the Rhine occupies the foreground, and the famous Bridge of Boats is very clearly shown. Anyone familiar with this city is likely to admit that the best possible point of view has been chosen, namely, that across the Bridge of Boats.

Other pictures of the series already issued are Edinburgh, Keswick and Derwentwater, and York Minster, amongst home scenery; while the foreign ones include the Falls of Schaffhausen, Niagara, the Mosque of Omar at Jerusalem, the Mer de Glace, and others. All of them are judiciously chosen to fulfil the object of being educational as

REDUCED SPECIMEN OF THE 'FITZROY' SERIES.

well as artistic; and they will serve remarkably well to illustrate lessons in Geography and History. The pictures may be had in various styles, unmounted, mounted, or framed, and the prices are very moderate.

Another series of pictures specially prepared for schools and other institutions is known as the *Fitzroy Pictures*, and is published by Messrs. George Bell and Sons. These pictures are altogether different from the 'A. L.' Photographs, and we fear the artists who superintend the issue of them would dissent from some of our remarks on the art value of photographs. But we do not mean to quarrel with Mr. Heywood Sumner and his colleagues. 'The Fitzroy Pictures are large prints, some chromolithographed and others coloured by hand.' They are beautiful, simple, imaginative, decorative. By means of boldly drawn outlines and broad harmonious colouring each of them tells a story or symbolizes a truth. Mr. H. Sumner says of them:—

> 'They were primarily intended for schools. We consider that such pictures should be simple, and should be regarded as having a sphere of their own in the child's education, namely, the decoration of bare and silent walls, and the direction of the child's vision and sympathy towards that which is actually beautiful, characteristic, and vital. . . . We desire that school walls should assert an ideal for children's eyes, and should accustom them to the language of graphic art; for if ever we are to have a wise, democratic patronage of art for England, such custom must begin early as a matter of common every-day life.
>
> 'We think the schoolroom should be recognised as a fair field for connecting art with daily life, and that when there is a desire for simple vital art on school walls, there will further arise a desire that our other public modern buildings should be more worthily and expressively adorned. Thus our aim touches on the large and intricate question of the spectacle of modern daily life, which has been shaped for so long by men of commerce and men of science. . . .
>
> 'Our actual productions are colour prints, not reproductions of paintings. Vitality of suggestion rather than imitative realisation is their mark. Selection of essentials—essential form, character, action, colour, and their re-combination in the form we have adopted, *i.e.*, arrangement of colour space bounded by expressive line is our method.'

The series has been named the Fitzroy Pictures, because they originated in discussions held in the studio of Mr. Selwyn Image in Fitzroy Street, and there the earlier pictures were first published.

They include a finely-designed cartoon of *St. George and the Dragon*, several scriptural pictures illustrating the life and work of Christ, some representing incidents in the history of Mighty Men of the Old Testament, the Four Seasons, Work and Play, and 'The Child's Garden.'

'*The Child's Garden*' is idealised by Louis Davis in two beautiful designs, one of which illustrates the motto 'Love rules his kingdom without a sword,' while the other, coloured by hand, bears the title 'In the morning sow thy seed.'

Among the specimens supplied for the purpose of this paper is a set of three large pictures designed by Heywood Sumner, to represent *The Nativity* in a triptychal arrangement, the centre showing the Infant Jesus, Mary and Joseph, while the Shepherds of Bethlehem occupy the left hand portion, and the Wise Men the right hand. The height of the centre is 58 inches, and of the sides 52 inches, the width of each being 18 inches. It will be understood that this set needs a large space to display it.

'*Cricket*,' another design by Mr. Sumner, is remarkably effective; it seems to bring with it the very atmosphere of the playing field. *Alfred the King* is a smaller picture, drawn by G. M. Gere, and printed in colours by Messrs. Jeffrey & Co.

These pictures have the twofold advantage of being the work of real artists, who are enthusiastic about their object, and of having been produced for the particular purpose of decorating schools. They have been fairly characterised in our quotations from Mr. Sumner, but we may be allowed to supplement these by quoting a letter in which the eminent ideal artist, 'the greatest poet-painter of our age,' Mr. G. F. Watts, expressed his approval of the series when projected:—

> 'Such a series should have a threefold value, in fact manifold—but the three that are obvious would be sufficient reasons for their production. The aid of the eye in Education, in the acquirement of knowledge, is much greater than is remembered or supposed: in the first place, it can make acquirement in many cases much more exact than appeal to any other faculty can; secondly, it is a great aid to memory; and thirdly, by its means instruction can be made much more amusing—no slight thing! Manifold; in awakening in the beginning of observation, through line and colour presented by art, acquaintance with those combinations in nature; with all the interest and quickening of the senses, which such acquaintance must lead to. . . . I also think the treatment proposed quite in the right direction. No ordinary pictorial effect should be aimed at, but the story told with all simplicity; the outline strong and distinct; the colour broad and flat.'

These pictures are of quite reasonable price as pictures, but their large size makes the cost of framing, which is necessary to any economical use of them, a matter of some consideration.

A third high class series of pictures for schoolroom wall decoration is published by Messrs. Griffith, Farran, Browne & Co.,

Limited. They are called—and, so far as may be judged from the samples before us, deservedly called—'Artistic Studies.' They are beautifully-coloured reproductions of the works of good artists; and are mounted on strong boards, tinted, varnished, eyeletted, and ready for hanging on the wall. They seem to be of American production, and were originally issued as supplements to a high-class art magazine now, we believe, not existing.

Most of the pictures are studies of flowers, but some represent animals, and a smaller number scenes. The colouring of the flowers is remarkably rich, and the arrangement very natural. On one card are two pictures representing roses, the one a bunch of *La France*, and the other a bunch of *Countess Castellane*. On another card three studies are given, *Chrysanthemums*, *Nasturtiums*, and *Red Rose* with *White Lilac*. Two separate pictures give admirable representations of a *Lightship*, and of *Stags in the Adirondacks*.

The size of these pictures varies, the smallest kind measuring 14 inches by 19, the largest being about twice as large, and the rest about a medium between the two. In all twenty-two are at present issued, and the number is to be added to at intervals. The prices are very reasonable, varying from two to three shillings according to the size of the picture.

These pictures would have a brilliant decorative effect on school walls; and they might well become in the advanced classes of a school types of art work or models, not exactly for copying, but for imitation.

There is yet another set of four cards of pictorial illustrations to which reference must be made, though it is with some hesitation that we include them in this paper. Our hesitation arises from the facts that the pictures are not in the strict sense of the term art pictures, that they are not obtainable in the ordinary way, and that they undoubtedly embody the advertising element, which is often thought to be inherently at variance with the artistic spirit. Our justification is based on the excellent quality of the productions, and on their undeniable suitability as pictorial adornments of school walls. The advertising element seems almost entirely excused by the ingenuity and unobtrusiveness of the means employed.

On four large cards, offered by Messrs. J. and J. Colman, of Norwich, are mounted colour-printed sheets showing respectively a series of *British Wild Flowers*, of *British Birds*, of *British Birds' Eggs*, and of *British Butterflies and Moths*. The last 120 are figured, and each of the other cards displays nearly a hundred specimens. The Birds' Eggs and the Butterflies and Moths are shown of their actual size, the Flowers and Birds are, of course, necessarily reduced. All the objects are shown in their natural colours, and the technical production of the illustrations appears to be without fault.

Each of the figures has for a letter of reference a small capital printed in red. These letters are repeated at the foot of the picture, followed by the common and technical names of the objects to which they are respectively attached. The columns of reference letters read acrostic fashion call attention to the various kinds of produce for which the Norwich firm of Colmans is famous.

We trust our readers will excuse our mention of these beautiful illustrations, which in any school may admirably serve for decorative and instructive uses. We understand that Messrs. Colman offer to present a set of the pictures to any school other than a Public Elementary School.

In another paper we hope to deal further with the subject of Art Pictures for Schoolroom Walls.

THE ART SECTION PRIZE COMPETITION.

There seems to be some little doubt about the Coupon in connection with the Competitions announced last month. *One Coupon* will be sufficient to cover the specimens sent in from any one department of a school. In case this should have caused a delay, the time for sending in will be extended till April 10th.

BRUSH DRAWING.

IV.

THE fourth stage introduces curved lines, and this again widens the scope of the work in as great a degree as the addition of the previous elements. The natural forms lose their stiffness—compare, for example, Fig. 15 in the February number with Fig. 16 in the present one. The conventional arrangements can be made more graceful—see Fig. 4 in the February article and Fig. 2 in the March paper, and contrast these with Figs. 4 and 5 now shown. The kite with a wavy tail looks much more life-like, if one may so express it, than if its tail were perfectly straight.

We should not, of course, fail to point out, or rather draw out from the children, that the swaying of the kite in the air would naturally cause this wavy line. You may readily illustrate it with a bit of string if necessary. Then, again, Fig. 14 is much more graceful than if it were composed wholly of straight lines. It is typical of the lily, hyacinth, bluebell, heather, etc., and, if possible, a natural specimen of these should always be held up before the class when doing such exercises.

Get the children to see that all these forms are really derived from nature, and encourage them to look for and suggest examples themselves.

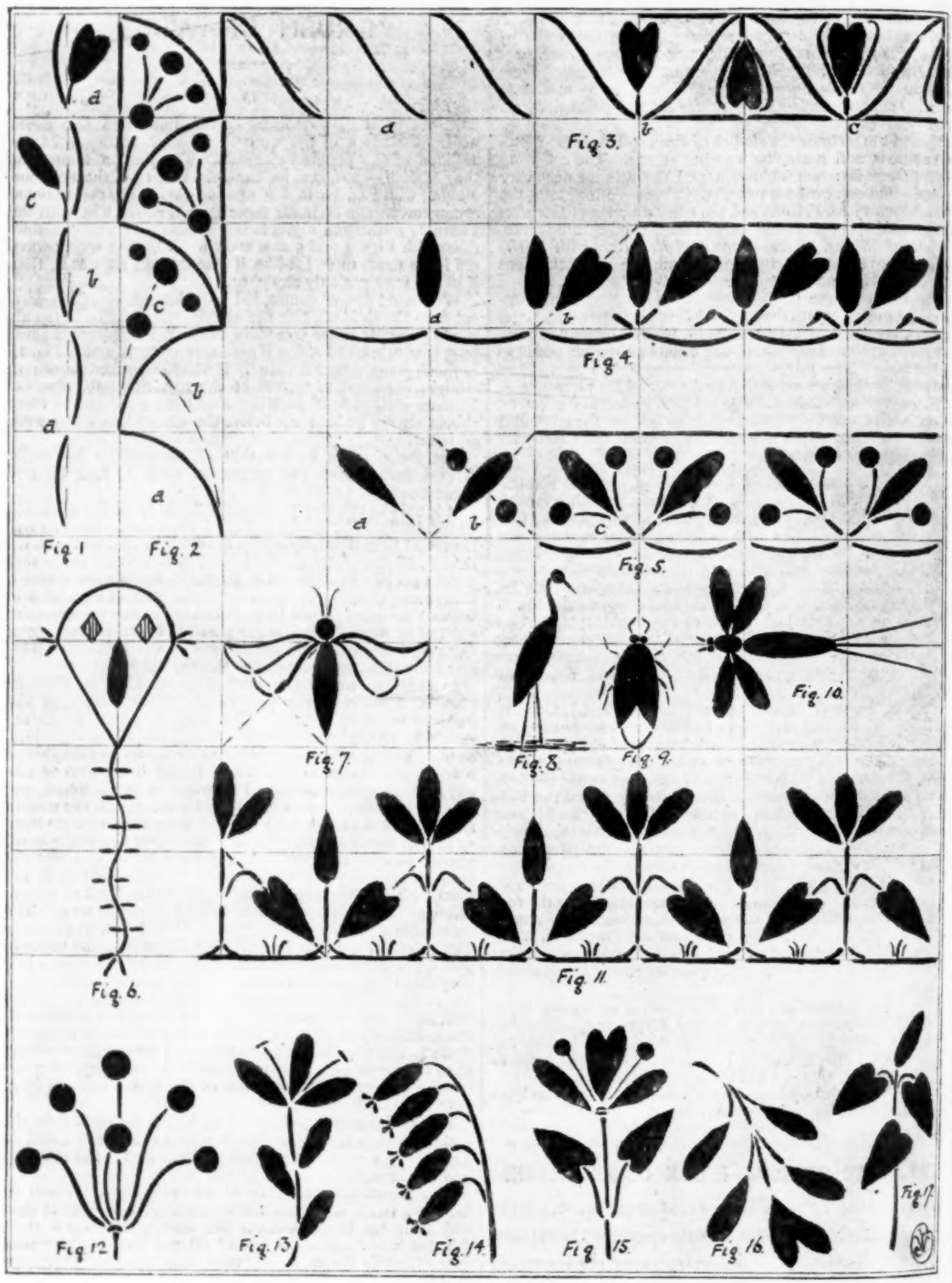
It is only in this way that the full benefits of the work will be obtained. The actual doing of the exercise is really less important than the thought that should be associated with it; though, of course, we all realise that it is only by *doing* that we can get the thought. Still, I trust all will recognise that it is essential, if the work is to be educational, as we wish it to be, that the mind should be exercised at the same time as the eye and hand, and this is easily possible if the natural prototypes of these forms are pointed out to the children. This sets them thinking, and teaches them to observe.

In order to render the method of working as clear as possible, I have in the present illustrations analysed the patterns in some degree. The first attempts at curves should be examples just simply winding about a straight line, as at *a*, Fig. 1. It will probably be necessary to take this as a separate exercise several times before being able to add any further development. But when it is mastered, put another little touch, as at *b*. It is far better that the strokes should not quite touch each other. Next add a single blob, as at *c*, or a double one, as at *d*. You may also add a berry similar to Fig. 2 in the last paper, or, better still, get the children to suggest something to fill the lower portion of the space. Thus this Fig. 1 may really be the basis of several lessons. Fig. 2 is treated in somewhat the same way. The curve across the diagonal is more difficult than that shown in Fig. 1, and in the first attempts it will probably be better to put in the diagonal as a guide. The dotted line shown in *b* may also be suggested with the pencil if you consider it necessary. Next locate the position of the dots—call them berries—and, lastly, add the stalks. I do not think you would have much difficulty in getting even the younger children to suggest something else to fill the space instead of the berries—drawing upon the forms previously used—such as the group of three blobs, Fig. 3, or the upper portion of Fig. 8, or a unit of Fig. 4, in the February number.

Follow this exercise with the kite, Fig. 6, drawn to twice the scale here shown. Notice that it utilises the curves learnt in Figs. 1 and 2—assuming that each wave in the tail takes up a whole square.

Fig. 3 introduces a curve of two directions. It will be better to twine it around the diagonal of a square at first, and then try to do without the line. Next draw it in different directions as at *b*, and fill the spaces either with new elements as at *c*, or with combinations previously learnt.

Fig. 4 is only a slight variation of Fig. 2 in the last article. Draw the curve first, then the single blobs as at *a*, and then the double blobs, *b*. The diagonal of the square may be put in if necessary.



DESIGNS FOR BRUSH DRAWING—FOURTH STAGE.

You should explain the reason for the little touch at the end of the stalk, and show a natural specimen.

The unit in Fig. 5 has been utilised before, in Fig. 4 of the second article. The setting out is shown at *a* and *b*, and note that the method is different from that shown in the previous example. In Fig. 4 the curved stalk is put in first, in Fig. 5 it is drawn last. What we want is to get these lines to look as though they did represent the stalk, and therefore try both methods to see which will produce the better result. If the stalk is drawn first, remember that a leaf has to come at the end, and that therefore the line must just have sufficient curvature to take the leaf naturally in the correct position.

The bird and insect forms, Figs. 7, 8, 9, and 10, are intensely interesting to children. They are clearly set out in the examples and need no special mention here.

Fig. 11 makes quite a quaint little frieze. It is really composed of Figs. 8 and 11 of the February number. The little curved lines at the bottom are to represent grass, and one almost wants to introduce little rabbits quietly nibbling at these tufts.

The adaptations from natural sprays, as before pointed out, gain very much from the employment of curved lines. At this period of the year, when the budding foliage and simple leaves can be so well represented by blobs, many exercises similar to these should be done. The primrose, the violet, the hyacinth may be rendered in simple form; the budding twigs and their manner of growth may also be readily expressed, and a knowledge of *things* thus gained.

After having worked through such a series of exercises as those suggested in the last three articles, the child should have gained some command over the brush, some knowledge of the simple principles of design, and some information about many natural forms, which cannot fail to be of service to him in after life.

We may now venture to leave the simple impressions and lines, and pass on to the next stage, where *drawing with the brush* will be needed.

NOTES OF A LESSON ON THE DISPERSION OF SEEDS.

BY PROFESSOR J. R. GREEN, SC.D., F.R.S.,

Examiner in Botany to the University of London, Late Examiner in Botany to the University of Cambridge.

SEE SUPPLEMENT PRESENTED WITH THIS NUMBER.

SPECIMENS REQUIRED.

THE specimens required for this lesson may easily be obtained during the summer. Examples of the *follicle* (Fig. 1) may be found in the Columbine, Larkspur, Aconite, and Pæony. With the pea pod (Fig. 2) may be compared the legumes of the Bean, Clover, Broom, and Saintfoin. The *siliqua* of the Wallflower (Fig. 3) is similar to that of the Stock, and should be examined in conjunction with the short *siliqua* or *silicula* of the Shepherd's Purse. Examples of the capsule are found in the Poppy, Pimpernel, Lychnis, and Balsam (Figs. 4, 5, 6, 7). The *cypsela* (Figs. 8, 15) may be seen in the fruit of the Dandelion and Bidens. In the Geranium (Fig. 9) we have an example of the *carcerule*, a fruit in which, when ripe, each carpel breaks away from the base of the axis and remains only attached at the top. The fruits of the Ash, Elm, and Maple (Figs. 12, 11, 10) are winged fruits or *samaras*, and must be distinguished from the winged seed of the Pine (Fig. 13). The *valvular capsule* of the Willow herb (Fig. 17) contains seeds crested with a tuft of hairs. The dry one-seeded fruits of the Traveller's Joy (Fig. 16) are bearded. The fruits of the Cleavers or Goose-grass (Fig. 18) are covered with minute prickles which adhere to animals.

OUTLINE OF LESSON.

I. WHAT IS A SEED?—A seed is the starting point of the development of a new plant. It is rather a complex structure, but it may be regarded as a very young plant or *embryo*, enclosed in certain coverings and furnished with a supply of nutritive matter or food to support it during the early stages of its growth and development. The nutriment is sometimes found in some part of the embryo itself, as in the pea or bean; sometimes in a tissue called the *endosperm*, which wraps round the embryo, as in the lily.

II. SEEDS ARE DISPERSED BY THE AUTOMATIC ACTION OF THE SEED VESSELS.—Seeds are dispersed in several ways. So far as the automatic action of the seed vessels is concerned in this process, fruits may be divided into three classes: (1) Expulsive or Sling Fruits; (2) Balistic or Catapult Fruits; (3) Creeping and Hopping Fruits.

1. *Expulsive or Sling Fruits* form a large group. In one class their seeds are sent to a long distance thus. When the fruits are ripe, the tissue round the seeds becomes highly tense, the tissue is rent at particular spots, and the segments double back and roll up, at the same time expelling the seeds. Sometimes the rolled parts of the fruit, less often the entire fruits themselves, are jerked off simultaneously with the seeds.

The fruit of a Balsam, *Impatiens Noli-me-tangere* (Fig. 7), is an elastic valvular capsule, composed of five carpels, and its walls are composed of three layers of cells. The larger, immediately under the epidermis or skin, is turgescent, consisting of large and extremely turgid cells. It is in a state of great tension, and when the seeds are ripe and the union between the five carpels is destroyed along the lines of union, the tension is relaxed, the loosened tissue of the lines is torn, the five carpels roll up, and the seeds contained in the fruit are jerked out.

In another class the expulsion of the seeds is due to the desiccation and consequent contraction of a special layer of the fruit wall, which leads to a rupture, and later to a bending over and rolling up of particular parts of the fruit. A good example is found in the fruit of the Marsh Cranesbill, *Geranium palustre* (see Fig. 9). It has a five-angled column, rising up in the centre of a circle of five carpels, which are hemispherical at the base and terminate in long bristles, or beaks. Each contains a single seed. When the seeds are ripe, the tissue of the beaks dries unequally, the outer layer, consisting of several plates of succulent cells, drying more quickly than the inner layer, which is composed of thick-walled cells. Consequently the beak lifts itself away from the axial column and curls up externally like a watch spring. The delicate dried tissue, which has hitherto served to hold the carpels together, offers no resistance; the cavity of each carpel is open along the inner surface, and the seed simply rests in it. Consequently the rapid drawing up of the beak has the effect of jerking it in a wide curve away from the carpel. In the Marsh Cranesbill the tops of the five beaks continue attached to the axis, and the fruit, after the seeds have been discharged, looks like a chandelier.

Together with the more marked Sling Fruits we may consider certain dehiscent fruits (Figs. 1, 2, 3, 4, 17, 5, 6), *i.e.*, fruits which open in such a way that their seeds are dispersed to some distance. The *follicle* (Fig. 1) is a fruit which, when ripe, splits down the part where the carpellary leaf was folded, and exposes the seeds. Good examples are found in the Columbine, Larkspur, Aconite, and Pæony, all common garden flowers. The *legume* (Fig. 2) differs from the follicle in splitting downwards both in the front and at the back, *i.e.*, it dehisces by both *dorsal* and *ventral sutures*, or back and front lines of splitting. When it is quite ripe, the halves of the pod separate and liberate the seeds, which are attached to each valve alternately. Good examples are found in the Pea, Bean, Clover, and Saintfoin. The *siliqua* (Fig. 3) is a long and narrow fruit, which is attached at the base to the flower stalk by a long partition called a *replum*, to which the seeds are attached. On each side of the replum the seeds are covered by a valve, and when the fruit is ripe these valves separate at the base and allow the seeds to fall. When a siliqua is as broad as it is long, it is called a silicula. Examples may be found in the Shepherd's Purse, which is almost triangular, and the well-known fruit of Honesty, which is round and about the size of a penny. *Capsule* is a general term for a dry fruit opening by valves, or pores. Good examples of valvular capsules are seen in the Willow herb (Fig. 17), the Pimpernel (Fig. 5), the Campion (Fig. 6), and the Balsam (Fig. 7). In the Willow herb the long pod-like capsule splits throughout its length, jerking its seed into the air. The capsule of the Pimpernel is called a *pyxis*, or little box. It is nearly spherical, and splits all round, so that the upper portion opens like a lid, exposing the seeds. The oblong capsule of the Campion has a contracted mouth which opens by splitting into numerous teeth, which curve backwards so as to leave the mouth open. The elastic valvular capsule of the Balsam has been already described. In the Poppy (Fig. 4), the capsule, instead of opening by valves, opens by pores. It is more or less oval, and is crowned

by the flattened disc-like stigma. When it is ripe, little pores open all round beneath the edges of this projection, and the seeds fall out. Such a capsule is said to dehisce by pores.

2. *Balistic or Catapult Fruits.*—We come now to a group in which the forcible expulsion of fruits is due to the elasticity of stems and fruit stalks. They are strongly resilient, and are strained and curved by a force acting from without. Directly the force ceases to act they return to their former position, and in doing so jerk the fruits and seeds borne by them to a distance. A good example is to be found in the species of *Centaurea*, where the involucral scales form a sort of basket, at the bottom of which are the fruits. In damp weather the tips of the tract-scales close tightly together, and the short bristles of the *pappus*, or modified calyx, crowning each fruit, are applied closely to one another. When the weather is warm and dry, the scales part asunder and the basket stands wide open. At the same time the hairs of the pappus bristle up, raising the fruits to the open mouth of the basket. Then if the flower stalk supporting the flower-head is set in motion, the fruits are tossed out like shuttle-cocks. The bristly pappus hairs in this case are not organs of flight. They are short and stiff, and besides raising the fruits, determine the direction of their fall.

3. *Creeping or Hopping Fruits.*—In the third group are fruits which creep or hop along the ground. They have stiff and very hygroscopic bristles projecting on one side from their external coats, and these bristles continually change their position according to the varying state of their environment with regard to moisture, and by so doing propel the fruits or seeds, as the case may be, in a definite direction. An example may be seen in the calyx bristles and stiff pappus hairs of the Scabious. The different parts alternately approach and recede from each other, causing a movement like that of creeping. The distance traversed by creeping or hopping plants seldom exceeds a few decimetres. Either the fruits are landed almost directly in some *cul de sac*, where they stay, or else they get entangled with the above-ground stems and leaves, and become embedded in the earth, where their seeds germinate.

III. Seeds are Dispersed by the Agency of Water.—The Yellow Stonecrop (*Sedum acre*) and some species of Speedwell form good examples of this mode of dispersal. In the Stonecrop the carpels are arranged radially, and are furnished at the base with wing-like borders, while the central part of the external surface of the fruit is shaped like a basin. In dry weather the five fruit *loculi* are closed, but directly a drop of rain falls on the concave centre they open wide, and the next few drops wash out the small seeds and convey them to the ground. As the rain penetrates into the tiniest crevices in rocks and walls, the seeds are carried into holes in vertical or overhanging cliffs, where they could hardly be deposited by any other mode of dispersion. Similarly in the cases of species of Speedwell which grow profusely on cultivated ground, the seeds are washed out of the gaping capsules by rain and conveyed to spots where the conditions are favourable to germination. In other species of Speedwell, which grow on banks and in running water, the capsules do not open till they are thoroughly wetted. The reason for this seems to be that if the wind dispersed them the seeds might be deposited on dry places, where they would certainly perish. The rain carries the seeds into the wet soil of the marsh, or into the shallow water of the brook or pond, where the conditions are favourable for their germination.

IV. Seeds are Dispersed by the Agency of the Wind.—The wind is one of the most important agencies in the dispersal of seeds. The seeds of water-plants, *e.g.* the White Water-lily, are enabled to float by their envelopes, and are driven along on the surface of the water by the wind. The wind also causes certain fruits to roll along upon the level ground, especially in regions where a long period of drought follows a short summer season. In several species of Clover there are only a few perfectly developed flowers in the cluster growing at the end of the flower stalk, while a number of abortive flowers are crowded together in a tuft in the middle of the inflorescence. The calyx teeth of the abortive flowers gradually increase in size and become long hairy bristles, which bend over outwards, forming a loose globular inclosure round the head of legumes. These balls afterwards become detached from the stalk and are rolled away by the wind. In only a small proportion of rolling fruits are the seeds strewn out as they are bowled along. Usually they do not escape till the fruits are brought to rest by encountering some obstacle they cannot surmount, the reason being that the seed vessels only open when they become wet.

Innumerable cases exist of wind-dispersed fruits and seeds which remain floating in the air for a shorter or longer time after severance from the plant on which they grow, and which have their fall retarded by special contrivances for the purpose. Such fruits and seeds must be so formed that the air offers great resistance to their fall, and it is important for them to have as small a weight as possible in relation to their size. The dust-like seeds of Orchids are so light that they can remain for a long while suspended in the air. Seeds which are shaped like leaflets, scales, or delicate discs, are more or less flattened, and their centre of gravity is so placed that they always present the broad side to the direction of descent. Some fruits are furnished with wing-like appendages, *e.g.* those of the Ash, Elm, and Maple (Figs. 12, 11, 10). These trees have a dry indehiscent winged fruit called a *samara*. In the Ash the pericarp is winged, which elongates the fruit in one direction. When it falls, the wind whirls it to a considerable distance, and it falls with the heaviest end containing the seed downwards into the moist soil. The *samara* of the Elm has a wing all round its circumference. That of the Maple is double, the two halves of the pericarp being joined in the centre, each with a wing extending outwards. Separation takes place after the fruit falls. In the Pine (Fig. 13) it is the true seeds, not the fruits, that are winged.

One of the most usual methods of keeping fruits and seeds suspended in the air is in the nature of a parachute. A good example is found in the one-celled dry indehiscent fruit, crowned by a pappus, of the Dandelion (Fig. 14). Here the minute spiny fruit is crowned by an elongated shaft, bearing at its summit when expanded a concave disc of radiating hairs, so that it can sail through the air like a parachute. In Fig. 8, the *cypsela* of a species of Bidens, the hairy pappus is suppressed. In the Thistle the pappus of the *cypsela* is plumose or feather-like.

Some fruits and seeds are embedded in masses of wool or in envelopes of silky hairs (*e.g.* the fruits of the Wood Anemone and the seeds of the Poplar and Willow), and thus remain for some time suspended in the air.

Some fruits and seeds again are kept suspended in the air by means of special hairy tails. In the Traveller's Joy (Fig. 16) the style is lengthened into a spirally curved tail which remains attached to one side of the fruit, and acts like a parachute.

V. Seeds are Dispersed by the Agency of Animals.—Fruits dispersed through the agency of animals fall into three classes:—(1) Fleshy fruits, (2) Sticky fruits, (3) Fruits furnished with hooks.

1. *Fleshy Fruits.*—Fleshy fruits, such as the Gooseberry, are eaten by thrushes and blackbirds. Such fruits and seeds as are destined to form the food of birds attract them partly by their colour, partly by their scent. Many fruits are red because this colour stands out clearly against the green foliage. Blue and black fruits have generally a background of ripe autumn leaves. White berries occur chiefly in plants which lose their leaves before their fruit is ripe. They are clearly visible against the leafless branches.

Many seeds are transferred from one spot to another by ants. They eat only a part of the seed-coat, and the seeds dragged by them under the ground or into crevices in walls germinate there during the next year. Here and there a seed is left behind on the route of the ant, which germinates during the following year. Thus the routes traversed by ants are often regularly planted with certain species of plants, *e.g. Chelidonium majus*.

2. *Sticky Fruits.*—Many fruits and seeds excrete sticky substances, by which they become attached to animals. A good example is found in the Meadow Saffron, whose seeds stick to the feet of cattle, sheep, and horses by means of a large *caruncle* which becomes viscid when it is wetted. Thus they are conveyed from one pasture to another.

3. *Fruits furnished with hooks.*—About ten per cent. of flowering plants have fruits or seeds furnished with claws or barbs which hook on to the hairs, bristles, or feathers of birds or other animals which come into contact with them. The animal gets rid of them as soon as possible, as they are a source of discomfort, but it is often not able to do so till a considerable distance has been traversed. Good examples are found in the burs of the Burdock and in the fruits of the Cleavers, or Goosegrass (Fig. 18), which are covered with minute hooks.

The agency of mud and wet boggy earth is efficacious in the case of numerous small fruits and seeds which adhere to birds when they come to the water's edge to drink. Jackdaws, herons, snipe, and swallows are very important instruments in this mode of dispersal. Many weeds which grow in fields and by roadsides are dispersed by the rain-soaked earth sticking to the feet of animals.

VI. Limits to the Dispersion of Seeds.—There are many checks on the dispersion of seeds. Of these may be enumerated:—(1) *The Sea*, in the case of land plants, for the number of plants capable of being transported across the sea by birds is extremely small. No fruit or seed has achieved the crossing of the ocean to Europe through the medium of the air, though in America there are a large number of plants fitted to thrive under the climatic conditions of Europe, and with fruits and seeds exquisitely adapted to aërial flight. (2) *The nature of the soil.* Spots in any particular district where a species thrives and multiplies are divided from one another by tracts in which it does not exist. (3) *Climatic conditions may be unfavourable.*

Our Tutorial Section.

THE LADY LICENTIATE IN ARTS;

OR,

HOW TO GET THE L.L.A.

Of all the many *volte-faces* that have characterised the Victorian era, certainly none has been more complete or more gratifying than that concerning the education of women. So radical has been the change, that it savours of ancient history to speak with anything but respect of the *bas-bleu* and of the sweet girl graduate. On all sides it is recognised not only that the well-educated woman has come to stay, but also that it is good for her to be here—good not for her alone, but for her brothers, her cousins, and her uncles, and for the community in general. Very early in the day the young and progress-loving universities opened wide their doors to the lady matriculant, and in welcoming her, paid her the compliment of putting her on an exact equality with her brother, a procedure that has been more than justified in the event.

The ancient university of St. Andrews went still further in its zeal for the higher education of women. Not content with admitting women to its examinations, it elaborated a course suitable for those who did not wish to take the course prescribed for the usual degree, and, recognising that if degrees are good for men they cannot be bad for women, it determined that successful students should have the right to assume the title of L.L.A., which has, with one consent, been accorded the status of a university degree. A glance at the list of places at home, in the colonies, and abroad, whence come the would-be Lady Licentiates in Arts, is quite sufficient to prove how widespread is the interest that has been aroused by this sagacious step, for which ladies all over the world will respect the name of Professor Knight of St. Andrews University.

In order to obtain this coveted diploma, it is necessary to pass in **seven subjects**, which, however, may be reduced by taking honours, each honours success ranking as a success in two subjects, so that six subjects, honours being taken in one, five with honours in two, or four with honours in three, will qualify for the diploma. Absolute choice of subjects is not now permitted. In the first place, the time table of the examination, which takes place in June of each year (the 1st, 2nd, and 3rd of that month being the dates for the current year), is necessarily so arranged that several subjects are taken at the same hour; consequently the student must so select her curriculum as to avoid overlapping at the examination. What this means will be apparent from the time table for 1897, which follows :—

TIME TABLE FOR 1897.

N.B.—The pass and honours papers will be given out simultaneously. The time allowed for each paper is three hours.

Tuesday, 1st June.—10 to 1—Latin, Political Economy, Chemistry, Hebrew, Biblical History and Literature, Hygiene. 2 to 5—Mathematics, Education, Comparative Philology, Theology, Geography.

Wednesday, 2nd June.—10 to 1—English Literature, Zoology, Italian, Æsthetics, Comparative Religion. 2 to 5—French, Botany, Biblical Criticism, Fine Art, Political Science.

Thursday, 3rd June.—10 to 1—Greek, Logic, Natural Philosophy, History, Geology, Music. 2 to 5—German, Moral Philosophy, Physiology, Church History, Astronomy.

In the second place, the subjects are classified in four departments, and one subject must be taken from each, the other three being taken from any of the four departments at the candidate's option. We append a list of the departments and the subjects contained therein :—

(*a*) The department of *Language*, including Latin, Greek, English (with Anglo-Saxon), French, German, Italian, Hebrew, Comparative Philology.

(*b*) The department of *Philosophy*, including Logic, Moral Philosophy, Political Economy, Æsthetics, Political Science, Comparative Religion.

(*c*) The department of *Science*, including Mathematics, Natural Philosophy, Chemistry, Astronomy, Geology, Physiology, Zoology, Botany.

(*d*) Other subjects, including Education, History, (Ancient and Modern), Theology, Biblical Criticism, Biblical History and Literature, Church History, Fine Art, Music, Geography, Hygiene.

The course which we have recommended to many students, and which we believe may be taken with profit by all who have not a special knowledge of other subjects not included in this list, is as follows :—

(*a*) English or French.
(*b*) Logic or Political Economy.
(*c*) Geology.
(*d*) Education, History, Geography.

In one of these subjects—preferably in Education—the honours course should be taken, which of course does not prevent honours being taken in others should the student feel sufficiently advanced to undertake the higher course.

There is no rule laid down as to the number of subjects to be taken in one year, nor is there any obligation to finish the course in a given time. Perfect freedom is allowed in both these particulars. A good student will probably qualify for the diploma in three years.

Centres for examination are settled according to the number of candidates from the various localities, but little difficulty will be experienced under this head, as centres are arranged for in nearly every large town in the country, to say nothing of colonial and foreign centres.

Candidates for examination apply for permission to sit early in the spring of each year, March 1st being the latest date for receiving applications in the present year.

The fee payable by candidates coming up for examination for the first time is **two guineas**, which covers two examinations. At a third or further subsequent examination a fee of **one guinea** is to be paid. In addition to this, the student who has completed the course has to pay a further fee of **four guineas** before receiving the diploma, using the title, or wearing the badge. Candidates who wish to sit at a foreign centre are required to pay half-a-guinea in excess of the above fees. There is no limit as to age, old and young alike being eligible for examination. Some evidence of a sound elementary education must be forthcoming before a candidate may be accepted. A long list of examinations considered sufficient will be found at the end of the prospectus: it will probably be enough for all who read this article to know that the teacher's certificate of the Education Department, of whatever division, is received as qualifying for candidature, but particulars should be given when application to sit is made.

The prospectus, giving full particulars as to the requirements in each branch, may be had by applying to 'The Secretary, L.L.A. Scheme, St. Andrew's University, Scotland,' from whom also may be obtained, upon payment of 1s. 2d., the calendar, which, besides giving full particulars of the requirements in every branch of the four departments, also contains all the questions set at the preceding examination.

In one respect the examination is somewhat peculiar, but at the same time very favourable to the student. Special books

covering the requisite ground are set, and the whole of the questions given in the June examination are upon the subject matter of these text books. It follows from this that there are no unpleasant surprises for the candidate when she takes up her paper of questions; moreover, the same questions recur again and again, so that a conscientious answering of back questions is certain to result in success. Altogether the examination is fairness itself, there being an evident desire to give every painstaking student a chance of success.

Different books are set for the honours as compared with the pass course, and there is no need to take the pass before proceeding to the honours division of a particular branch. In honours Education there is a choice of two alternatives permitted. In the first place a student may elect to be examined from the prescribed books, as in the other branches. In the second place she may, should she so prefer, take the pass examination and, in addition, write a thesis on the teaching of any subject. This has to be submitted to the examiner who, if he thinks the level of merit high enough, will—supposing the student has been successful in the pass work—certify her for honours in this particular branch. It is the deliberate opinion of the writer of this article that the books set for honours in Education are easier than those set for the pass. Wherefore he recommends honours candidates in Education to take the former of these two courses.

This article has been written in order to ascertain whether or no there is a sufficiency of aspirants for the L.L.A. amongst the readers of THE PRACTICAL TEACHER to justify us in devoting space to tuition preparatory to this examination. Supposing a considerable number of requests for a course to be forthcoming, we shall certainly proceed to furnish a course of training in honours Education, possibly in one or two other subjects in addition. It is therefore requested that would-be students of this course should make known their desires to the Editor at an early date. After due consideration an announcement of our intentions will be made, and should it be thought advisable to initiate a course of instruction, our issue for September will contain the opening stages of the preparation. The matter, therefore, now practically rests with our readers, whose Aye or Nay will be our *mot d'ordre*.

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

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PUPIL TEACHERS' COURSE.

1. FOR APRIL 1897.—TWELFTH MONTH.

WORK TO BE PREPARED.

(Students are invited to write for assistance in cases of doubt or difficulty.)

The Examination is fixed for April 10th. The remaining time will be devoted to revisal of the chief points in the various subjects, to assist in which revisal the following notes should be studied:—

English.

Finish revision of all books. Pay particular attention to prefixes, affixes, meanings of allusions, etc. Be quite sure of the life of the author, and know something of his other works and his contemporaries. Second Year Students should note that in the New Code the lines from the *Task*, Book IV., are 1 to **373**, not 363 as previously announced. The paraphrase is, of course, of great importance, not only for the marks it bears in the English paper, but also because it is largely considered in assessing the marks for Composition.

First Year P.T.'s should note: Verses 4, 8, 9, 10, 20, 24 and 25, 29, 31, 32 of the Elegy.

Second Year P.T.'s must know all the allusions and note the paraphrases of lines 89–97, 120–140, 174–188, 200–210, 212–224, 243–258, 276–290, 311–330, 331–340.

Third Year P.T.'s will have plenty to do in the revision of the play. Besides a clear understanding of the text, each should be prepared to write a character of any of the leading persons, to explain any of the Roman habits and customs referred to, to give the etymology of peculiar words, and to be able to write a good critical life of Shakespeare, with an account of his works.

There is generally plenty of choice in the questions, but the compulsory question should always be attempted.

Paraphrase of the *Task* (concluded).

As I looked at the landscape this afternoon it presented a pleasing harmony of colours. The meadows, though they had lost the vivid freshness of early spring, were still green, and formed an attractive contrast to those fields which, recently golden with the ripened corn, were now by the plough changed to a rich brown. Further away spread the fallow lands, partially covered with a rank vegetation which supplied food to the various animals feeding upon it, while beyond the leafless woods stretched to the horizon and were scarcely discernible against the gathering gloom of night.

The scene in the morning will bear a totally different aspect, as during the evening it is being affected by the agency of the softly falling and continuous snow, which gradually obliterates all colour and hides even the forms of the various objects, concealing them under a mantle of purest white. Not without its use is this soft covering, which shields the earth from the biting frost, and protects the tender grass and flowers, which would otherwise perish.

In this world of trouble and care, where perfect happiness is unattainable, since it is always attended by some distressing grief, it is but the act of a wise man to compare his position with that of persons less favourably situated, not, indeed, in any spirit of pride, superiority, or self-satisfaction, but with a desire to find out in what respects he is more blessed than they, to minimise his troubles by contrasting them with others much more serious, and to impress his mind with that active sympathy which should always be felt towards those in distressing circumstances.

In such a mood I pity him who is compelled to brave the elements on such a night as this. In the distance I see what appears to be a slowly moving hill of snow, but which on a nearer approach proves to be a heavily laden waggon, its wheels clogged with the snow, which deadens all noise and which largely increases the work of the panting team. The patient horses set themselves steadily to the work, and with bent neck and dilated nostrils they slowly advance with their burden. The breath is immediately frozen in the keen wintry air and collects in icy particles on their swelling breasts. Beside them stalks the waggoner in thick and heavy boots, defending with one hand his hat against the continual attacks of the wind, except when both hands are needed to wield the long whip which effectually urges the team to renewed exertions. His sturdy form is well suited for such inclement weather, and though he is compelled to partially close his eyes and pucker his face, and open his mouth to breathe in the keen wind, yet no serious effects are likely to ensue from such exposure.

He is indeed happy to be devoid of that sensibility to pain which is usually the result of refinement of mind. He is never under the necessity of consulting a doctor, and even the bitter east winds which are so dreaded by many and are so serious in their effects on the old and infirm, seem but to increase his health and vitality. Continually abroad with his team, he has no household worries, his only care is his companion the waggon, and his dumb friends the team which drag it about. May he, though rough in speech and manner, treat them with consideration and kindness, and thereby set an example to the rich, who, though professing kindness, show but little when they hurry from place to place heedless of the distress of their over-driven horses.

Arithmetic.

This being the most highly marked of the subjects, is therefore of the greatest importance, and it is necessary to repeat once again what has been urged so often in these columns—that accuracy is not sufficient, but that method and arrangement must be carefully attended to. The paper should be a perfect model of neatness and lucidity. Every sum must be accompanied by sufficient verbal explanation to enable the examiner to follow each step. If the reasoning is good and correct you will score marks, though there may be a slip in the working.

In all years the *theory and manner of teaching* must be very carefully and thoroughly revised.

Make sure of the Metric System and all questions likely to arise on it.

Special stress is, in the New Code, laid upon the 'lack of ingenuity' in Arithmetic displayed by P.T.'s.

Favourite topics for questions are:—The rules and proof of L.C.M. and G.C.M.; the various operations in fractions and their proof by diagram; recurring decimals and the proof of the rule for reducing recurring decimals to vulgar fractions; ratio and proportion; theory of interest and discount.

THE METRIC SYSTEM.

The formation of the Metric System is due to the zeal of the French reformers of 1793, who, anxious to get rid of everything associated with the past, devised a new and most sensible and easy system of weights and measures.

One ten-millionth part of a quarter of the earth's polar circumference was obtained as nearly as possible by triangulation. This was called the Metre (Greek, *metron* = a measure). It was sub-divided by tenths and multiplied by tenths for other measures, so that the table of measurement is:—

10 millimetres	= 1 centimetre.
10 centimetres	= 1 decimetre.
10 decimetres	= 1 metre.
10 metres	= 1 decametre.
10 decametres	= 1 hectometre.
10 hectometres	= 1 kilometre.
10 kilometres	= 1 myriametre.

It will be observed that the Latin prefixes *milli*, *centi*, *deci* are used for sub-divisions, and the Greek prefixes *deca*, *hecto*, *kilo*, *myria* are used for multiples. This is adopted in all other measures and weights.

The following table shows the chief points to be learnt :—

Table.	Unit.	English Equivalent.	How Obtained.
Length -	Metre -	39·3708 inches	$\frac{1}{10000000}$ part of ¼ of earth's circumference.
Area -	Are -	1076·429 sq. ft.	100 square metres (Square Decametre).
Capacity -	Litre -	1·76 pints -	Cubic Decimetre.
Solidity -	Stere -	35·3165 cu. ft. -	Cubic Metre.
Weight -	Gramme -	·032 oz. (Troy)	The weight of a Cubic Centimetre of water at a given temperature.

The advantages of such a system are obvious. There are no compound rules, reduction may be done at sight. *E.g.*, Reduce 7 kilometres 6 hectometres 7 decametres 3 metres 7 decimetres 8 centimetres 9 millimetres to millimetres = 7673789, to metres = 7673·789, to centimetres = 767378·9, etc. Or, to take another example in weight, multiply 1 kilogramme 7 hectogrammes 8 decagrammes 5 grammes 8 decigrammes by 121. This = 17858 decigrammmes × 121 = 2160818 decigrammes = 216 kilog. 0 hektog. 8 decag. 1 gr. 8 decig.

Another example :—7 hectolitres 3 decalitres 5 litres 3 decilitres 8 centilitres @ 12 francs 75 centimes per litre. The amount equals 735·38 litres and the money 12·75 francs. Multiply by ordinary multiplication = 9376·0950. That is 9376 francs 9·5 centimes.

The adoption of such a system in England would be a great boon, although it might cause some little difficulty at first. A decimal system of coinage advocated for England is 10 mils = 1 cent, 10 cents = 1 florin, 10 florins = £1. Thus a *cent* or hundredth part of a £ would be about 2*d.*, a mil about ¼*d.*, a 5 mil piece would do duty for a penny, and a 5 cent piece for a shilling.

It would be advisable to work a few examples in these weights and measures till thoroughly known.

Music.

All P.T.'s should take this paper. The work is very little and the scope for questions small. The syllabus is clearly detailed.

Geography.

Finish revision. Make sure of answers to questions below. Practise Memory Maps every day. 'Be prepared to draw maps of parts of N. America, *e.g.*, British N. America, United States, West Indies, or Central America.

South America.

1. Name and describe the great plains of S. America, stating their position.
2. Draw a sketch map of S. America, inserting the chief mountain ranges and rivers.
3. Describe the climate of S. America, comparing it as far as possible with that of Africa.
4. Give some account of the wild and domestic animals of S. America, showing their distribution and mentioning any peculiarities.
5. Write an account of the mountain systems of S. America.
6. Describe the La Plata and the streams which unite to form it.
7. Describe, with a sketch map, the basin of the Amazon.
8. Enumerate the islands connected with S. America. To whom do they belong?
9. Explain Selvas, Campos, Llanos, Pampas, Tierra del Fuego, El Gran Chaco.
10. Name the chief vegetable products which enter into the commerce of S. America.
11. Name the states of S. America, their capitals and form of government.
12. Describe the surface of Brazil and name chief products.
13. Name six seaports, describe their position and their chief exports.
14. Write an account of the mineral wealth of America.
15. Where and for what noted are the following?—Aspinwall, Panama, Cartagena, Bogota, Maracaybo, Caracas, La Guayra, Cumana, Margarita, Merida, Valencia, Georgetown, New Amsterdam, Nassau, Paramaribo, Cayenne, Santarem, Matto Grosso, S. Paulo, Rio Janeiro, Bahia, Pernambuco, Maranhao, Para, Quito, Guayaquil, Callao, Lima, Arequipa, Arica, Cuzco, Titicaca, La Paz, Oruro, Chuquisaca, Potosi, Iquique, Copiapo, Coquimbo, Valparaiso, Santiago, Valdivia, Stanley, Buenos Ayres, Rosario, Monte Video, Paysandu, Mendoza, Corrientes, Asuncion, Chimborazo, Cotopaxi, Sorata, Aconcagua.

Australia, New Zealand, and Polynesia.

16. Describe the mountain and river system of Australia. How do you account for the dryness of the interior?
17. Say what you can of the *native* flora and fauna of Australia.
18. Describe, with a sketch map, the basin of the Murray.
19. Describe the principal mountain chains of Australia.
20. Draw an outline map of Australia, showing how it is divided and the position of its chief towns.
21. Explain clearly how Australia is governed.
22. Give an account of the chief industries of Australia.
23. Say all you can of Tasmania.
24. Give some account of the aboriginal races of Australia and New Zealand.
25. Name the provinces of Australia, and their capitals, and give the dates when they were founded.
26. What are the chief industries in Australia? Give some account of one of them.
27. Where and what are the following?—Melbourne, Ballarat, Geelong, Sandhurst, Echuca, Sydney, Broken Hill, Newcastle, Parramatta, Goulbourn, Bathurst, Brisbane, Rockhampton, Maryborough, Townsville, Adelaide, Port Adelaide, Palmerston, Wallaroo, Port Augusta, Perth, Albany, Coolgardie, Southern Cross, York, Freemantle, Hobart, Launceston.
28. What are the chief imports and exports of Australia?
29. Describe the physical features of New Zealand.
30. What do you know of the climate and productions of New Zealand?
31. Give some account of the people of New Zealand—their religion, education' government, and occupations.
32. What do you know of Auckland, New Plymouth, Napier, Wellington, Blenheim, Christchurch, Port Lyttelton, Dunedin, Invercargill, Hokitika?
33. Enumerate the chief islands of the Pacific. How may they be classified?
34. Describe the Fiji Islands or the Sandwich Islands.
35. What are the chief imports and exports of the Pacific?
36. Name the races of people inhabiting Melanesia and Polynesia, and show any points of difference in their appearance and character.

History.

Finish revision. Prepare answers, where necessary, to questions given below. Be particularly careful to know (*a*) Important Statutes; (*b*) Wars, their Causes, and Treaties; (*c*) the Advances during the present reign, and (*d*) chief dates.

1. When and under what circumstances did England lose large portions of her possessions in North America?
2. What wars have at different times been carried on by Great Britain in any part of North America? Give dates.
3. Say what you know of Sir Robert Peel and Canning.
4. Give accounts of three of the following :—Battles of Boyne, Nile, Inkerman, Trafalgar, and Austerlitz.
5. How did our forefathers look upon barracks and a standing army?
6. What Acts have at different times regulated the succession to the English throne?
7. What do you know of two of the following :—Chartists, Repeal of Corn Laws, Catholic Emancipation, Sepoy Mutiny?
8. Name any writers and statesmen of the present reign, and say a few words about one of each.
9. What changes have been made in the constitution of the House of Commons between 1830 and the present time?
10. Trace the descent of Queen Victoria from James I.
11. What were the chief immediate results of the Reform Bill?
12. Write an account of the Indian mutiny, with dates.
13. How does a man become a member of the House of Commons? Describe the rights and privileges of that House, and tell in what its power consists.
14. Who sit in the House of Peers? Explain the name, and discuss the constitutional advantages of a second Chamber.
15. What is meant by Member of Parliament, the Government, the Cabinet, Assizes, Prime Minister, Budget, Appropriation of Supplies, Chancellor of the Exchequer?
16. Compare travelling now with that of 90 years ago.
17. What do you know of the growth of education in the 19th century?
18. Mention six great events of the last ten years, giving dates, and write a brief account of one of them.

Pupil Teachers' Examination, October 1895.

1. Write a short account of the Seven Years' War, and its results as they affected our colonial possessions.
2. Name some of the leading statesmen in the second half of the 18th century. Write a short account of *two* of them.
3. Give some account of the Union of the Parliaments of England and Scotland. What were the chief terms of the Union?
4. Assign events to these dates :—1704, 1714, 1745, 1752, 1776, 1798.
5. Write what you can of the career and character of Sir Robert Walpole *or* Warren Hastings.
6. Give an account of *one* of the following :—
   (*a*) The rebellion of 1845.
   (*b*) The agitation for Free Trade.
   (*c*) Catholic Emancipation.
19. How had India been governed previously to 1858? What change was then made?
20. What events occurred at Cabul and Jelalabad in 1841, 1842; Ferozeshah and Googerat in 1845-9; Canton and Pekin in 1857-60; Magdala in 1868?
21. Who were our allies during the Crimean War? Why was Sebastopol selected for attack? Describe briefly the character of the battles of Alma, Balaclava, and Inkerman.
22. Mention and describe any instance in the 18th century of a Popular Riot, Speculative Mania, Religious Revival, Panic in London, Outbreak of Religious Fanaticism.
23. What do you know of the Excise Scheme, the Quadruple Alliance, the Drapier Letters, the Alien Bill?
24. Write an account of the rise and progress of newspapers.
25. 'Wilkes brought about three great advances in the Constitution.' Explain.
26. Mention any women of note in the 18th and 19th centuries, and give some account of one.

Euclid, Algebra, and Mensuration.

Revise all theory. Learn formulæ if not known. Be prepared to work out Propositions in Euclid with different letters from those in text-book.

School Management.

Revise generally. Make sure of answers to questions previously asked.

Penmanship.

Practise daily. Practise your copy at the examination once before writing.

Points for the Exam.

Be in good time—Be provided with all necessary apparatus—Divide up the time fairly between the questions—Allow time for revision—Work as neatly as you can—Answer to the point; it is useless to write round a question—Work your hardest.

Next month we shall start a fresh course and deal with the new work prescribed.

OCTOBER EXAMINATION, 1897.

SEVENTH MONTH.

WORK TO BE PREPARED.

A.—*English.*

(As the special books cannot be fully dealt with in these columns, students must write for assistance in cases of doubt or difficulty.)

First Year.

1. The Verb: Gerunds and Participles. There must be carefully distinguished and examples selected from the poem. Unless this distinction is thoroughly understood, continual mistakes will be made.
2. Revise the Anglo-Saxon suffixes.
3. Prepare verses 25–28 of Gray's 'Elegy in a Country Churchyard.' Learn meanings of all allusions and references, and the derivations of the chief words.

Second Year.

1. The Preposition, Classification, etc. Distinguish between the same word used as a Preposition and Conjunction.
2. Finish all Anglo-Saxon prefixes with examples.
3. Prepare lines 243–276 of the 'Winter Evening' (*Task*, Book IV.). Make sure of all meanings, explanation of allusions, derivation of chief words. Be particularly careful of the paraphrasing.

Third Year.

1. Learn 20 roots and meanings each week.
2. *Julius Cæsar.*—Prepare Act IV., Scenes 1 and 2, and first 100 lines of Scene 3. Note particularly Antony's description of Lepidus and all the speeches in the quarrel between Brutus and Cassius.

The analysis, parsing, and paraphrase will require considerable thought and attention. Any difficulties encountered must be sent up for solution.

B.—*Arithmetic.*

First Year.

Boys.—Lock. Work Example LIX. Miscellaneous Examples on Fractions. This is a particularly good collection of general examples.

Girls.—Dixon and Beach. Example XXXV. Work Nos. 1–30.

Second Year.

Boys.—Lock. Percentages and Interest.

Girls.—Dixon and Beach. Work Examples XX. and XXI.

Third Year.

Boys.—Lock. Work Examples for Exercise Nos. 951–975.

Girls.—Dixon and Beach. Read Chapter XXVII. and work all Examples.

(Pay the greatest attention to neatness, arrangement, and general method.)

C.—*Music.*

Finish the year's work. Revise any weak points and answer any back questions.

D.—*Spelling.*

Learn 50 words per week from 'Words Commonly Misspelt,' or any good list. Test by Dictation.

E.—*Geography.*

Mexico and Central America and the West Indies.

Pay great attention to productions, industries, governments, etc., in the West Indies. Note the various possessions of the European powers. Study Jamaica especially. Draw maps for all parts. Continual mapping is the only way to fix the position of places.

F.—*History.*

George IV. and *William IV.*

Chief points (George IV):—
Cato Street Conspiracy.
The dispute with regard to and trial of Queen Catherine.
Battle of Navarino.
Abolition of the Corporation and Test Acts.
Catholic Emancipation Bill.

(William IV.):—
The Reform Bill.
Abolition of Slavery.
New Poor Law.
Municipal Reform Act.

G.—*Euclid.*

Second Year.—Book I., Propositions 20–24, and four deductions per week.

Third Year.—Book I., Propositions 47–48, and four deductions per week.

H.—*Algebra.*

Third Year.—Chapters XIV. and XV. 'Scholarship Algebra,' L.C.M. and Fractions. Use factors wherever possible; it abbreviates work very much.

I.—*Teaching.*

Second Year.—'Scholarship School Management,' Chapter VII. The Teaching of Arithmetic (as far as Compound Rules.)

Third Year.—'Scholarship School Management,' Chapter XIII. (Finish.)

QUESTIONS TO BE ANSWERED.

1. *Penmanship.*—Write as specimens of—
   (*a*) Largehand: Rhythmically, Syllogistical, Telegraphy, Universally.
   (*b*) Smallhand: One morn I missed him on the accustomed hill.

(Take a few minutes' practice each day at this exercise, writing from a good model.)

2. Write an essay each week, selecting from:—
   Habit as a moulder of character—British manufactures—Study—Children's games—A day's excursion in the country—A day's visit to a town—Fishing.

3. Notes of Lessons. (A criticism lesson must be given each week.) First Year P.T.'s should write outlines, others full notes.
   Starch—Division of Decimals—Wind—Reading Lesson to Standard IV.—West Indies—Coal Gas—A Candle Flame.

4. *First Year.*
   (1) Analyse verse 13 and parse *but, knowledge, rich, did, ne'er, genial, current.*
   (2) Analyse verse 14 and parse *Full, many, a, purest, is born to blush unseen, waste.*
   (3) Analyse verse 15 and parse *some, village, that, tyrant, may rest, guiltless.*
   (4) Analyse verse 16 and parse *applause, listening, to command, plenty, smiling, their history, nations.*
   (5) Give the meaning and function of the suffix in the following words:—*knowledge, penury, current, purest, sweetness, dauntless, inglorious, guiltless.*

Second Year.
   (1) Paraphrase lines 243–258; 267–276.
   (2) Analyse lines 243–250 and parse *once again, season, methinks, one hand, employed, other charge.*
   ,, ,, 253–258 and parse *just, save that, thine, no less than, indeed, on high, resplendent less.*
   ,, ,, 260–266 and parse *whether, to weaving nets, born to please, make thee welcome still.*
   ,, ,, 267–276 and parse *just, might have seen, whole, too, perhaps, there by fits.*

Third Year.
   (1) Paraphrase Act IV., Sc. 1.
   (*a*) Octavius, I have seen more days than you.
   . . . . . .
   And graze in commons.
   (*b*) So is my horse
   . . . . .
   But as a property.
   (*c*) Act IV. Sc. 3.
   Remember March . . .
   Than such a Roman.
   (2) Analyse the above passages and parse:—
   Do not talk of him but as a property.
   You wronged yourself to write in such a case.
   But for supporting robbers.
   Let it appear so.

5. What do you understand by the term 'Dominion of Canada'? Tabulate the chief productions.
6. Give some account of the great railway lines of America.
7. Mention 10 large towns in North America and say what you can of *one* of them.
8. Describe the battle of Waterloo.
9. Give an account of the social condition of England in 1815–20.
10. What are some of the commonest mistakes made by children in writing? How would you correct them?

SCHOLARSHIP COURSE FOR DECEMBER 1897.

4TH MONTH—APRIL 1897.

1. *Reading.* } Ten minutes' practice at each daily. For Reading
2. *Writing.* } take Scott's 'Ivanhoe.'

3. *Spelling.*—50 words per week from 'Words Commonly Mis-spelt,' or any good list. Test by Dictation of passage from good writers.

4. *Composition.*—Write one or two essays each week, selecting from the following :—

The Value of Time—Westminster Abbey—Birds and Insects as friends to man—Progress during the present reign—Free Libraries—The British Constitution—Description of an English Cathedral—Criticism of some book you have read.

(Read up all you can about your subject. Arrange matter in heads, and deal with each in a separate paragraph. No effort must be spared to make this a strong subject.)

5. *English.*—

(*a*) The Verb, fully. Learn correct definitions of all terms used. Make quite sure of the classification as Regular or Irregular, Weak or Strong, etc.

The participles and gerunds will require attention. The subjunctive mood is rarely understood. The various uses of the Infinitive should also be noted.

(*b*) 25 Roots and meanings per week.

(*c*) Literature. Meiklejohn, Chapter IV.

6. *Arithmetic.*—Percentages and averages. Remember that percentage of loss or gain is always calculated on the cost price.

Girls.—Algebra. Blackie's Elementary. Subtraction.

7. *Algebra.*—Hall & Knight, Exercises XVI*a*. to XVII*f*.

Too much stress cannot be laid upon the importance of understanding thoroughly the exercises on Factors. On a proper understanding of them depends the working of Fractions, L.C.M., G.C.M., and a large number of Equations.

8. *Euclid.*—Book I. Props. 25–30. Deductions. Egan's Exercises, 60–80.

9. *Geography.*

(*a*) Finish Australia and prepare New Zealand.

(*b*) Revise Holland, Belgium, Denmark, and Scandinavia.

QUEENSLAND.

Area, 668,497 sq. miles. Population, 450,000.

Productions.—Wheat, oats, barley, maize, coffee, sugar, cotton, oranges, peaches, pineapples, etc.

Exports.—Wool, gold, silver, lead, tin, pearl and tortoiseshell, meat, fruit, oysters, bêche-de-mer, sugar, timber, hides, skins, coal, tallow, live-stock.

Live Stock.—Half a million horses, 7 million cattle, 20 million sheep, 90,000 pigs.

Chief Towns.—Brisbane, Rockhampton, Maryborough, Townsville, Port Douglas, Ipswich, Gympie, and Bundaberg.

Government.—Separate colony, 1759.

Governor (Lord Lamington) with Legislative Council (41), and Assembly (72).

SOUTH AUSTRALIA (a misnomer—a better term suggested—Centralia).

Area, 903,690 sq. miles. Population, 352,797.

Productions :—

Wheat, oats, potatoes, hops, and fruits of all kinds.

Copper, iron, silver, lead, wool.

(200,000 horses, 700,000 cattle, 7½ million sheep.)

Note the copper mines of Moonta, Wallaroo, and Burra.

Towns.—Adelaide, Port Adelaide, Gawler, Kapunda, Kooringa, Palmerston.

Government :—

Governor (Sir Thomas Buxton) and Executive Council of 6.

Legislative Council.

House of Assembly.

WEST AUSTRALIA.

Area, 978,000 sq. miles. Population, 89,550.

Productions.—Mainly the same as other colonies in Australia.

The gold mines of Yilyarn and Coolgardie are being rapidly developed.

Exports.—Wool, timber (jarrah and karri), sandalwood, pearls and pearl-shells, gold, guano, tin-ore, and skins.

Towns.—Perth, Fremantle, Albany, Geraldton, Coolgardie, York, etc.

Government :—

Governor (Sir Gerard Smith).

Legislative Council.

Legislative Assembly.

TASMANIA.

Area, 26,215 sq. miles. Population, 160,000.

Productions.—Timber, wool, gold, silver, copper, tin, fruit, and wheat.

Towns.—Hobart, Launceston, Warratah, Ringarooma, etc.

Government :—

Governor (Viscount Gormanston) and Council.

Legislative Council.

House of Assembly.

Prepare maps of each. The necessity of preparing the geography thoroughly and exhaustively cannot be too much insisted on.)

10. *History.*

HENRY IV., HENRY V., HENRY VI., EDWARD IV., EDWARD V., AND RICHARD III.

Chief points :—

Henry IV.—

The first of the Lancastrian Kings. Prepare a genealogical table showing his claim.

French aid to Scots (defeated at Homildon Hill) and to Welsh.

Revolts against the King :—

1. Earls of Huntingdon, Kent, and Salisbury.
2. Wales under Owen Glyndwr; joined by the Percies; Battle of Shrewsbury.
3. Percy, Northumberland, and Scrope; execution of the latter, 1407.
4. Earl of Northumberland; defeat and death at Bramham Moor, 1408.

Statutes.—*De Heretico Comburendo* directed against the Lollards, an account of whom must be prepared.

Henry V.—

The Lollards. Continued persecution, execution of Oldcastle in 1417.

The Renewal of French War.

Henry revived Edward's absurd claim. The nobles were tired of peace, the merchants wanted new markets, and the rate of pay of common men-at-arms was three times that of a labourer, so the war was very popular.

Henry landed and besieged Harfleur, but after his army was thinned by sickness he endeavoured to make for Calais, crossed the Somme, beat the French at Agincourt (which must be carefully read up). In 1420 Henry again crossed the Channel, and after ravaging Normandy the Treaty of Troyes was signed, which provided that Henry should marry Catherine and become king on the death of Charles.

His early death prevented this. His widow married Owen Tudor, from whom was descended Henry VII.

Henry VI.—

Minority.

Bedford, Protector of the Realm and Regent of France.

Gloucester, Regent in England in Bedford's absence.

War in France.

The Dauphin never agreed to the Treaty of Troyes, and as Charles died shortly after Henry V., he at once became King of what part of France he could, and commenced hostilities. The English were assisted largely by the Duke of Burgundy.

1423.—Battle of Crevaut. }
1424.—Battle of Verneuil. } In all of which the English were successful.
1428.—Battle of Herrings. }

Siege of Orleans, raised by Joan of Arc, from which time the English power rapidly declined. After conducting Charles to Rheims she was, in 1431, taken and burnt by the English.

A quarrel with the Duke of Burgundy and the death of Bedford further weakened the English cause, and notwithstanding the heroic attempts of Talbot in 1453 nothing remained but Calais.

Jack Cade's Rebellion.—Social and political discontent.

Home Affairs.

This was a period of aristocratic factions and generally weak rule. Gloucester, the popular leader, was opposed to Beaufort, Bishop of Winchester, the head of the Court party.

1442.—Henry came of age, and ruled with the advice of Beaufort, whose influence superseded Gloucester's. The latter died in 1447, and shortly after Beaufort followed him. Suffolk, who had risen into importance after the King's marriage with Margaret of Anjou, was held responsible for the loss of the French provinces, was banished and murdered at sea. The rival leaders then were Richard, Duke of York, and Somerset. In 1453 Henry went mad, and York was appointed Protector, and Somerset was imprisoned. The next year the King recovered, York was dismissed and Somerset released. The Duke of York then raised an army and marched on London, and the Wars of the Roses commenced.

Wars of the Roses.

Causes :—

1. The jealousy of the great barons, and the indecent scramble for power.
2. The weak rule of Henry VI.
3. The antipathy to Margaret of Anjou.
4. The existence of a powerful leader—Richard, Duke of York, who thought he had a better right to the throne than the King himself.

The Yorkshire Claim :—

A genealogical table, showing the descent of the Yorkist and Lancastrian families, must be prepared and carefully learnt.

Briefly: Richard, Duke of York, was, through his father, descended from Edmund, fifth son of Edward II.; through his mother, from Lionel, Duke of Clarence, third son of Edward III.; while Henry VI. was descended from John of Gaunt, fourth son of Edward III. The Duke of York was thus, on one side of an older branch than the King. He was also allied, by marriage, with the Nevilles, who were most powerful.

Battles :—

1455. St. Alban's. Yorkists victorious.
1459. Blore Heath. " "
1460. Northampton. " "
1460. Wakefield. Lancastrians victorious. Duke of York killed.
1461. Mortimer's Cross. Yorkists victorious.
1461. St. Alban's. Lancastrians victorious.
1461. Towton. Yorkists victorious.
1464. Hedgeley Moor and Hexham. Yorkists victorious.
1471. Barnet. Yorkists victorious.
1471. Tewkesbury. Yorkists victorious.

Note the following :—

The Wars of the Roses, their character and results :—

It is a common mistake to suppose that the whole of the nation was involved in these sanguinary contests; but this is not so. The war was carried on by the great barons and their armed retainers, and the general commons of the country pursued their usual avocations with less interruption, perhaps, than would have been received in time of peace. The results briefly were :—

(*a*) The final Extinction of the Feudal System. The loss of life among the barons and their retainers was enormous, and practically exterminated the powerful houses, which had kept up semi-regal state. One feature of the struggle, which is most terrible, is the ferocity with

which both parties took revenge for the deaths of kinsfolk. This introduction of personal feud into a political contest accounts for the fierce contests and great loss of life. Those barons who still remained were so impoverished that they were glad to sell their estates and settle down as country gentry. Some even had to fly the country, and gained precarious livings by any menial work.

(*b*) The growth of commercial prosperity and enterprise. The great towns did well out of the contest, by obtaining concessions from both parties.

(*c*) The rise of a new nobility. Henry VII., on his accession, was able to rule quite absolutely. There were no great barons to hold him in check, and he took care that they did not regain their lost power. The new men were personal friends, who dared not oppose him.

This period is the closing scene of the 'Middle Ages,' or 'Dark Ages,' when brute strength was the only law of right. Henceforth a new era. Modern history starts, when intellect and mental ability were placed before rude strength and savagery.

Richard III., 1483-1485.

Richard's means of obtaining and securing the throne; Buckingham's rebellion; abolishment of Benevolences; Earl of Richmond's invasion and Battle of Bosworth. Note that Richard III. was a most able ruler and soldier, and probably, had the throne come to him in a quiet and legitimate way, would have made a great king. He certainly was not the fiend portrayed by Shakespeare.

Learn the following note:—

Advances of the Constitution under the Lancastrians and Yorkists.—As the house of Lancaster reigned solely by the choice of the people and sanction of Parliament, they seldom, if ever, ventured openly to resist the powers of the Commons, who took advantage of the circumstances to make many advances, the chief of which were:—

1. They maintained and completely established their exclusive right of taxation.
2. They controlled public expenditure, voted their supplies for special purposes, and saw that they were properly spent.
3. They made supplies depend upon redress of grievances.
4. They controlled the king's household expenditure.
5. They established more fully the fact that laws can only be made by the consent of King, Lords, and Commons.
6. They began to give advice on matters of foreign policy.
7. They maintained the right to impeach bad ministers, to freedom of speech, and freedom from arrest.

11. *Teaching.*—'Scholarship School Management,' Chapter IV.

The Teaching of Reading.

12. *Domestic Economy.*—Beverages. Methods of Preserving Foods. Modes of Cooking.

13. *Music.*—'School Music Teacher,' Chapter IV.

14. *French.*

The Adverb.

La Grammaire, next 3 pages.

TEST QUESTIONS.

1. Write as specimens of copy-setting:—

(*a*) Largehand:—

Geographically, Hieroglyphics, Idiosyncrasy, Jurisprudence.

(*b*) Smallhand:—

One glorious hour of crowded life
Is worth an age without a name.

2. Analyse the following passages, and parse the words in italics:—

(i.)
Merciful *heaven*,
Thou rather with thy sharp and sulphurous bolt
Splinst the unwedgeable and gnarled oak
Than the soft myrtle; but man, proud man,
Drest in a little brief authority,
Plays *such* fantastic tricks before high heaven
As make the angels weep; who with our spleens
Would *all themselves laugh mortal*.

(ii.)
How beautiful is night!
A dewy freshness fills the silent air,
No mist obscures, nor cloud, nor speck, *nor stain*
Breaks the serene of heaven.
In full-orbed glory yonder moon divine
Rolls through the dark blue depths.
Beneath her steady ray
The desert circle spreads
Like the round *ocean, girdled* with the sky.
How beautiful is night!

(iii.)
Not *wholly* in the busy world, nor quite
Beyond it, blooms the garden *that* I love.
News of the humming city comes to it
In sound of funeral or of marriage bells;
And *sitting* muffled in dark leaves you hear
The windy clanging of the minster clock,
Although between it and the garden lies
A league of grass, *washed* by a slow broad stream,
That, *stirred* with languid pulses of the oar,
Waves all its lazy lilies, and creeps *on*
Barge-laden to three arches of a bridge
Crowned with the minster tower.

3. What do you know of Caxton? Point out the importance of the introduction of printing.

4. Write out a classification of Pronouns, and add notes on any peculiarities of the Indefinite Pronouns.

5. Work the following test paper in decimals:—

(*a*) In what sense can ·9 be said to be equal to 1?

(*b*) What Vulgar Fractions can be expressed by Finite Decimals, and why?

(*c*) Prove the rule for converting Recurring Decimals into Vulgar Fractions.

(*d*) Express in its simplest form $\frac{1\cdot5\dot{4}7\dot{6} \times 10\cdot618}{2\cdot\dot{6}54\dot{7}}$.

Ans. 6·10.

(*e*) Divide $\frac{\cdot052}{1\cdot3}$ of 1·56 by $\frac{\cdot0624}{14\cdot4}$ of 25·92.

Ans. $\frac{5}{6}$.

(*f*) Find the value of $(\frac{3}{4} + \frac{2}{3})$ of 4 guineas + (·09 − ·01) of £2 1s. 3d. + (5·05 ÷ ·005) of 5s. Ans. £257 2s. 2½d.

(*g*) A's share is ·09 of B's, B's is 3·08 of C's, C's is 1·1 of D's. C's share is £2,750. Find A's, B's, and D's.

Ans. A = £770, B = £8,470, D = £2,500.

(*h*) Five bells which commence tolling together, toll at intervals of 1·2, 1·5, 1·75, 1·8, 2·1 seconds respectively; at what intervals will they all toll together? Ans. 126 seconds.

(*i*) $\frac{8\cdot571428 \times 1\cdot7 \times \cdot21\dot{6} \text{ of } \cdot625}{2\frac{2}{3} \text{ of } 1\cdot285714 \times \cdot48}$.

Ans. $1\cdot22974537\dot{0}$.

6. How are the Australian colonies governed?

7. Say what you can of the native fauna and flora of Australia.

8. Enumerate some of the legal reforms of Edward I. and Edward III.

9. Trace the causes of the Villeins' Revolt, and point out the chief results. Why did the rebels attack lawyers and burn all documents found?

10. What kind of apparatus would be needed in giving a lesson on the Seasons? Explain how it would be used.

11. Compare, as articles of food, fish, rabbit, beef, and pork.

12. Which are the most useful vegetables in common use? What is the value of *green* vegetables as an article of diet?

CORRESPONDENCE.

RULES.

1. Individual assistance will be given as far as possible by advice, solution of difficulties in any subjects, model answers, etc.
2. Specimens of Writing, Paraphrasing, Maps, Composition, etc., will be marked and criticised gratis.
3. To assist students in rural districts, Freehand or Model Drawings will be corrected and marked, with hints for improvement, etc., and returned if accompanied by a postage stamp.
4. As a rule, all replies will appear in the Correspondence Column, by anyone desiring an immediate reply may obtain it by enclosing a stamped addressed envelope.
5. To ensure an answer in the next issue queries must be sent by the 15th of each month.
6. Name and address of sender, with coupon of current number of the PRACTICAL TEACHER, and *nom de plume* if desired, must be enclosed.

All communications and queries with regard to the PUPIL TEACHERS' AND SCHOLARSHIP COURSE should be addressed to 'A. T. FLUX, 12, Lower Park Road, Belvedere, Kent.'

ANSWERS TO CORRESPONDENTS.

HOPEFUL.—For translation, try Messrs. Cornish, High Holborn. For a cheap text, John Murray, Albemarle Street. Essay 50/60. Rather too long for examination. Penmanship 50/60. Smallhand should be slightly larger.

SNOWDROP.—Writing 40/60. You need practice from a good model. The Metric System *is* required for Second and Third Years.

J. R.—Writing 45/60. Lacking in regularity.

J. F. P. IRON DOCK.—Send up for any you need.

ANSWERED BY POST.—J.G.A. (Risely); M.I. (Mow Cop); J.E.H (Castle Eden); O.S. (Runcorn); B.A. (Loughborough); S.S. (St. Helens); E.J.S. (Andover); P.L. (Airdrie); E.E.M. (Gnosall); H.H. (Wadsby); F.P. (Dunmow); F.S. (Diss); J.W.B. (Bardney); A.M.C.A. (Bedford); J. Le F. (Saxmundham); A.M. (Leyton); H.J.B. (Luton); A.O., etc.

OUR 1897 CERTIFICATE CLASS.

BY J. C. HOROBIN, M.A.,

Principal, Cavendish College, Cambridge.

The Examination for Certificates will commence on Monday, 12th July 1897, at 2 p.m.

The general conditions for candidates are to be found in Articles 55–64 and 116–121 of the current Code.

Logic—Questions and Answers.

1. Let it be granted that the study of Logic does not help us to reason better—is it therefore unprofitable?

2. To what classes of terms would you refer the following: equality, university, the schools, school board, examiner, examination, the vice-chancellor? Give your reasons.

3. To which of the Heads of Predicables are the predicates of the following propositions to be referred?
   (1) Knowledge is power.
   (2) Only the virtuous are happy.
   (3) London is the largest city in the world.

4. Criticize the following definitions:—
   (1) Necessity is the mother of invention.
   (2) Necessity is an irresistible force.
   (3) Caviare is a kind of food.
   (4) Peace is the opposite of war.

5. Restate the following propositions so as to show clearly the subject and predicate, the quantity and quality of each:—
   (1) Not all your efforts can save him.
   (2) Not all his statements are false.
   (3) There is no place like home.
   (4) Keble College is the only college founded in Oxford since 1850.
   (5) Among the sights of Cambridge the visitor should not omit the Fitzwilliam Museum.

6. If it be granted that an O proposition is false, what can you infer as to the opposed propositions?

1. No; for the investigation of the laws which govern the operation of the intellect must always be one of the most interesting and therefore profitable subjects of study. In other words, Logic as a science has claims on our attention, even supposing that as an art it does *not teach us to reason* better.

2. *Equality* is an abstract term, because it denotes the quality of being equal without any direct reference to any objects which are equal.

University is a collective term, because it denotes a body of men collected together for the pursuit of learning.

The Schools is a singular term, because it denotes the building in which scholastic examinations are held.

School Board is a collective term, because it denotes a body of men collected together for the management of a school or schools.

Examiner is a common term, because it denotes a class of men to each individual member of whom the term is applied.

Examination is a common term, because it denotes a class of things to each particular instance of which the term is applied.

The vice-chancellor is a singular term, because it denotes a singular individual.

Of the above terms *university*, *schools*, and *school board* may also be regarded as common terms, for there are many universities, schools, and school boards; that is, they are names respectively of *classes* of things.

3. (1) Knowledge is Power.
   Power is here a Genus.
   (2) Only the virtuous are happy.
   Happy is here to be referred to the Head of Accident; for the virtuous are not all happy.
   (3) London is the largest city in the world.
   Here *largest in the world* comes under the head of Differentia, *city* indicates the Species.

4. (1) This violates Rule 3, being expressed in figurative language.
   (2) A valid definition.
   (3) The genus only is given; the differentia 'formed from the roe of sturgeon' is wanting to make it complete.
   (4) This violates Rule 2, defining by an opposite term.

5. (1) No efforts—of—yours (subject) are able—to—save—him (predicate). Universal negative (E).
   (2) Some of—his—statements (subject) are not false (predicate). Particular negative (O).
   (3) No place (subject) is equal—to—home (predicate) (E).
   (4) The—only—College—founded—in—Oxford—since—1850 (subject) is Keble (predicate) (A).
   (5) The—Fitzwilliam Museum (subject) is among—the—sights—of—Cambridge—which—the—visitor—should—not—omit (predicate) (A).

6. That E is false, A true, and I true.

Solution of some Questions on School Management.

What do you understand by 'the tone of a school'? How is it created, and what is its precise value in education?

By 'the tone of a school' is meant the ethical ideal which makes itself felt in the arrangements, organization, and discipline of the school.

It is created and fostered by such management as brings into play regard, love, and sympathy for others as a corrective to the present and egoistic stimuli most effective in young children. It presupposes the universalistic as an aim at least equal in value to the egoistic.

Its precise value is that it is the most potent factor next to home influences in subordinating the 'impulsive self' of the child to the 'ideal self' of the reasoning being.

It brings into action the feelings and the will, conscious of the rights of others, in contradistinction to the mere mimetic egoistical hedonistic action of the very young child.

What is the difference between sensation, perception, and observation?

(1) Sensation is a mental state due to action of externals.

E.g., Coloured ball of Gift I. { colour, contact, pressure, temperature.

(2) Perception is the externalising of sensations, depends on discrimination.

Compares { memories of past sensations. present sensations.

Result is externalised.

E.g. { Red ball of to-day. Blue ball or cube of yesterday.

(3) Ordered perception { Likeness = Marks of genus. Unlikeness = Differentia.

E.g. { Balls for colour. Geometrical figures for shape.

What is the difference between memory and recollection? How can memory be strengthened? What are the special subjects in which it is desirable to cause words and sentences to be committed to memory?

Memory { Retention. Reproduction = Recollection.

Memory strengthened { Cultivate observation. ,, attention (voluntary). Repeat examples. Associations must be a causal relationship.

Verbal memory is useful { Mathematics { Tables of different kinds. Geography { Statistical facts. Arrangements. History { Dates. Order of events. Poetry for language.

In what order should the faculties of children be called into exercise? What parts should receive particular attention in the training of infants?

(1) Sense impressions.
(2) Memory.
(3) Imagination.
(4) Conception.
(5) Judgment.
(6) Reasoning.
Infants (1—2—3).
Observation should be exhaustive by hand and eye.

What is meant by a sense impression and a concept? Describe the process of perceiving.

A sensation is the mental state resultant on the stimulus of an organ of sense.

The steps are { Outward stimulus. / Nerve change. / Brain change. / Mental impression.

A concept is a general notion, the idea of a class of things possessing similar attributes.

Perceiving { Sensation (present) / ,, (past) } = percept.

Questions and Solutions in Mensuration.

FIRST YEAR.

1. The sides of a field are 27, 364, 357, 76 yds., respectively, and the angle between the two first is a right angle. Find the area in acres.

2. If the sides of a right-angled triangle are in A.P., to what numbers are they proportional?

3. A regular octagon is formed by cutting off the corners of a square symmetrically; prove that a side of the octagon equals the difference between the diagonal and a side of a square.

4. Find approximately the cost of boarding an hexagonal floor whose side is 24 feet, at tenpence per sq. yd.

5. Find to the nearest foot the diameter of a circle whose area is half an acre.

SECOND YEAR.

1. The sides adjacent to the right angle of a triangle are 9 in., and 3 ft. 4 in.; if it revolve about the hypotenuse, find the volume of the solid generated.

2. Find the volume of a prism on a triangular base, the sides of the base being 17, 39, 44 ins., and height 73 in.

3. A cubical block of wood is put into a lathe and turned into a sphere, with the least possible waste; compare the weights of the wood before and after turning.

4. A cone and hemisphere have equal bases and equal volumes; find the ratio of their heights.

5. A sphere floats with $\frac{3}{4}$ of its surface immersed; find what fraction of its volume is immersed.

Solutions.

FIRST YEAR.

1. Diagonal $= \sqrt{27^2 + 364^2} = 365$.

Area of right-angle triangle is $\frac{27 \times 364}{2} = 4{,}914$ yds.

,, other triangle is given by

$$\sqrt{399 \times 323 \times 42 \times 34} = 13566.$$

Adding the two results and reducing to acres, the area is $3\frac{9}{11}$ acres.

2. Using I. 47 we have, taking a as common difference,

$$x^2 + (x + a)^2 = (x + 2a)^2$$
$$x = 3a.$$
$$\therefore \text{ sides are as } 3a : 4a : 5a,$$
$$\text{or, } 3 : 4 : 5.$$

3. Let a be side of octagon, and part cut off from each side of square be x, then

$$a = x\sqrt{2}$$
$$\text{Side of square is } 2x + a = 2x + \sqrt{2}$$
$$= x\sqrt{2}\,(\sqrt{2} + 1)$$
$$\text{Diagonal is } \sqrt{2} \text{ side, or} = x\sqrt{2}\,\sqrt{2}\,(\sqrt{2} + 1)$$
$$= 2x\,(\sqrt{2} + 1).$$

Difference between diagonal and side is

$$2x\,(\sqrt{2} + 1) - \sqrt{2}x\,(\sqrt{2} + 1) = x\,(\sqrt{2} + 1)\,\{2 - \sqrt{2}\}$$
$$= x\sqrt{2} = a.$$

4. In a hexagon side is radius of circumscribed circle,

$$\therefore r = 24 \text{ feet.}$$

Area of polygon is $\frac{6 \times 24^2}{2} \times \frac{\sqrt{3}}{2}$, viz. $\left(\frac{nr^2}{2} \sin \frac{2\pi}{n}\right)$.

$$\therefore \text{Cost is } \left(\frac{6 \times 12^2 \times 1{\cdot}73}{9} \times \frac{10}{12}\right) = \underline{£6\ 18s.\ 5d.}$$

5. $\frac{\text{Acre}}{2} = (\frac{1}{2} \times 4840 \times 9) \text{ sq. ft.} = \pi r^2;$

$$\therefore r = \underline{83{\cdot}2},$$
$$d = \underline{166{\cdot}4 \text{ ft.}}$$

SECOND YEAR.

1. Hypotenuse of $\Delta = \sqrt{81 + 1600}$

$$= \sqrt{1681} = 41;$$
$$\frac{r}{2} \times 41 = \frac{360}{2};$$
$$r = \frac{720}{82} = \frac{360}{41}.$$

Volume of solid = volume of 2 cones

$$= \frac{\pi r^2}{3} \times 41$$
$$= \frac{11}{7} \times \frac{\overset{10}{\cancel{360}}}{41} \times \frac{\overset{5}{\cancel{360}}}{41} \times \frac{41}{1} \times \frac{1}{\cancel{1728}_{144}^{12}}$$
$$= \frac{550}{287} = 1\frac{263}{287} \text{ cubic feet.}$$

2. Volume = base × height

$$= \sqrt{50 \times 6 \times 11 \times 33 \times 73} \text{ cubic inches}$$
$$= \sqrt{5^2 \times 2^2 \times 3^2 \times 11^2 \times 73} \text{ cubic inches}$$
$$= \frac{330 \times 73}{1728} = \frac{4015}{288} \text{ cubic feet} = \underline{13\frac{271}{288}}.$$

3. Suppose side of cube is a,

Then volume $= a^3$;

Radius of sphere would be $\frac{a}{2}$;

$$\text{Then volume of sphere} = \frac{\overset{1}{\cancel{4}}}{3} \times \frac{\overset{11}{\cancel{22}}}{7} \times \frac{a^3}{\underset{1}{\cancel{8}}}$$
$$= \frac{11a^3}{21}.$$

Since they are of same material their weights are to one another as their volumes.

$$\frac{\text{weight of cube}}{\text{weight of sphere}} = \frac{a^3}{\frac{11}{21}a^3} = \underline{\frac{21}{11}}. \quad \text{Ans.}$$

4. Volume of cone $= \frac{\pi r^2}{3} . h;$

$$\text{Volume of hemisphere} = \frac{2}{3}\pi r^2 . r$$
$$= \frac{\pi r^2}{3} . 2r.$$
$$\therefore \frac{\text{Volume of cone}}{\text{Volume of cylinder}} = \frac{\frac{\pi r^2}{3} . h}{\pi r^2 . 2r} = \frac{h}{2r}.$$

Since the volumes are equal,

$$\therefore h = \underline{2r}$$
$$\text{or } \frac{h}{r} = \underline{\frac{2}{1}}. \quad \text{Ans.}$$

5. Segments of spheres vary directly as the heights.

$$\therefore \frac{\text{height of immersed segment}}{\text{height of segment out of water}} = \frac{3}{1},$$

$$\frac{\text{volume of segment out of water}}{\text{volume of sphere}} = \frac{\frac{\pi h}{6}\{3x^2 + h^2\}}{\frac{4}{3}\pi r^3}$$

$$\text{and } x^2 = \frac{3r^2}{4};$$

$$\therefore h = \frac{r}{2}.$$

$$\frac{\text{volume of segment out of water}}{\text{volume of sphere}} = \frac{\frac{\pi r}{12}\left\{9\frac{r^2}{4} + \frac{r^2}{4}\right\}}{\frac{4}{3}\pi r^3}$$

$$= \frac{10\frac{\pi r^3}{48}}{\frac{4}{3}\pi r^3} = \frac{5}{32};$$

$$\therefore \frac{\text{volume immersed}}{\text{volume of sphere}} = \frac{27}{32}.$$

Questions for Tests.

First Year.

1. Write in large, half-text, and small hand :—
'Imperium in Imperio.'

2. Dictation :—
I went down on the deck, | and did not like the expression of relief | that came over the captain's face | when he found what I had come for. The transmission of the parrot | from the ship to the cab was an easy matter, | as he was in a cage, | but the stork was merely tethered by one leg ; | and although he did his best, | when brought to the foot of the ladder, | in trying to get up, | he failed utterly, | and had to be half-shoved, | half-hauled all the way ; | which, as he got astride, | after the manner of equestrians, | on every other bar, | was a work of some difficulty. I hurried him into the cab, | and, ordering the man to drive as quickly as possible, | got in with my guests. At first, I had to keep dodging my head about, | to keep my face away from his bill as he turned round ; | but all of a sudden | he broke the little window at the back of the cab, | thrust his head through,—and would keep it there, | notwithstanding I kept pulling him back. Consequently, when we drew up at my door, | there was a mob of about a thousand strong around us. I got him in as quickly as I could, and shut the door.

School Management.

1. Draw up notes on questioning and answering for a Third Year P.T., indicating clearly what should be done in the case of answers being not to the point.

2. Explain precisely the value you put on pattern and on simultaneous reading respectively.

3. Write down any passage you can remember suitable for the Fourth Standard, and indicate how you would deal with it if it came in a reading lesson.

Composition.

1. Fifty Years under Free Trade.
2. Charity.
3. Employment *v.* Idleness.

Arithmetic.

1. Two and a half per cents. are at 92½, two and three-quarters at 97½. A person has a sum to invest which will produce £100 more of the former stock than of the latter. Find the difference of income by investing in either stock, neglecting brokerage.

2. Work as on a B.B. for children :
The sides of a triangle are proportioned to 2½, 3, 3½, their sum is 338 feet. Find each side.

3. Reduce to simplest form :

$$\frac{\cdot 02\dot{6}}{\cdot 10\dot{6}} \text{ of } 2\cdot 8375 \text{ of } £960 - \frac{17}{38} \text{ of } 1\frac{4}{357} \text{ of } £11\ 11\text{s.}$$

4. Find the true discount on £309 19s. 11½d. due 6 months hence at 3½ per annum.

Music.

1. What other four contiguous tones of the scale are separated by the same steps or intervals as (1) *s l t d'* and (2) $l_1\ t_1\ d\ r$?

2. Describe the mental effects of the following notes :—(1) *me* ; (2) *fah* ; (3) *te* ; (4) *lah* ; (5) *doh*.

3. Name (as major sixth, etc.) the following intervals :—
(1) m—d' (2) r—s (3) t_1—l (4) f—t (5) l_1—s
(6) m—t (7) ta—r' (8) m—fe

4. Re-arrange the following notes in order of pitch, placing the highest note first in each case :—
(1) s d fe l t_1 d' m ta r' f r m'
(2) d s_1 r f_1 fe t_1 ta m l_1 s d'

5. Which of the following notes is highest in pitch and which lowest ?
(1) t_1 in Key C. (2) r in Key A. (3) s in Key D. (4) f in Key B flat. (5) l_1 in Key E flat.

6. State the major scale relation (as subdominant, etc.) of the following tones :—
(1) m (2) s (3) d (4) f (5) t (6) l

7. Fill up two measures of each of the following kinds, showing half-pulse notes, continuations, and rests in each example. Vary the contents of the measures in each time. (1) Two-pulse measure; (2) Four-pulse measure ; (3) Three-pulse measure.

8. Write figures over the following to indicate the value (as 1 pulse, 1½ etc.) of each note and rest :—

| s :- .l,s	| f .,m :r.	| m .d :f	|
| m :	| r :—	| — :r,m.f	\}
| s :—	| :	| .f :m .r,d	|
| r .m :f .,	| m :—	| — : —	||

English.

1. Analyse and *parse* all the verbs in :
(*a*) 'Visit to Spring Gardens.'
'As I was sitting . . . mind his book.'
(*b*) 'Palace of Art.'
Lines 277–284.

2. Comment on :
(*a*) We spin—thridded—cubb'd—shrilly—Aidoneus—blur—serpent-wanded power—King of shadows—saw thee and flash'd—Eleusis—climate-changing bird—Demeter—Persephone—wakes—ashy rains.
(*b*) Jogged—a praising—Hector—Pyrrhus—Mohocks—the Committee—the Evil—trepanned—that martyr—Busby—Widow Truby—plum porridge—smutting—chines—fain—the stone.

3. Write an essay on the Roman, English, and Norman-French elements in the English language.

Geography.

1. Write an account of Tunis, Tripoli, and Algeria.
2. Describe the physical features and races which inhabit the Sahara.
3. What do you know of Prince Henry of Portugal—Covilham—Bruce—Mungo Park—Major Laing—René Caillié ?

History.

1. What do you know of the Independents and Presbyterians ?
2. Write an account of the relations of the Army with the Parliament and the King (1647).
3. Write short biographies of Clive—Hastings—Pitt.
4. Give an account of the causes, events, and results of the Wars of the Roses.

Men only.

Algebra.

1. Solve the equations :—

(*a*) $\frac{2(4x-8)}{x-3} - \frac{x-1}{3} = 8.$

(*b*) $\frac{\sqrt{x+12} + \sqrt{12}}{\sqrt{x+12} - \sqrt{12}} = 2.$

(*c*) $x + 2y - 3z = -8.$
$x + 2z - y = 18.$
$2y + 2z - x = 30.$

2. Define factor, term, index, homogeneous.

Is $a^3b^{\frac{1}{2}}c^{\frac{1}{2}} + a^2b^3c^{-\frac{1}{2}} + a^{\frac{1}{2}}b^{\frac{1}{2}}c^2$ homogeneous ?

Show that $x^4 + 81$ is never less that $18x^2$, and that $a^3 + b^3 = 9ab - 27$ if $a + b + 3 = 0$.

Let A and B be two integral expressions, of which H is the H.C.F. and L the L.C.M., then,

$$HL = AB.$$

Geometry.

1. Prove I., 26.
   The locus of a point which is equally distant from two fixed lines is the pair of lines which bisect the angles made by the fixed lines.
2. Prove II.
   Divide a given line so that the rectangle contained by its parts may have a maximum area.
3. Prove III., 37.
   Describe a circle passing through two given points and touching a given line.

WOMEN ONLY.

Needlework.

1. Make up the given calico (a piece 12″ × 6″) in the form of a sleeve of a chemise, half size—stitch half and feather-stitch the remainder.

Domestic Economy.

1. Discuss the relative advantages of 'natural' and 'dyed' wool.
2. Discuss the relative value of animal and vegetable food stuffs. What are the precise arguments in favour of a mixed diet?

OR,

Geometry.

1. Prove I., 18 and 19.
   Three equal lines cannot be drawn from the same point to the same straight line.

SECOND YEAR.

Penmanship.
Dictation.
Composition.
Geography.
History.
Arithmetic.
Music.
} As First Year.

School Management.

1. Distinguish between 'articulation,' 'emphasis,' and 'pronunciation.' What methods should you adopt with a Reading class to ensure that these shall be respectively 'clear,' 'just,' and 'correct'?
2. What is meant by the faculty of observation? Why should it be exercised, and how may it best be trained and strengthened in young children?
3. Make out a scheme of object lessons suited for use in Standards I. to IV., so as to continue the course begun in the Infant School, and to prepare the scholars for taking up some branch of science as a specific subject in Standard V.
4. Name some special difficulties which teachers have to encounter under the heads of 'Disposition,' 'Will,' and 'Habits,' and show how these may be most successfully overcome.
5. Write notes of a lesson on these subjects :—
   (1) Her Majesty's Jubilee; (2) the Grasshopper and Cricket; (3) the declension of the First personal pronoun, singular and plural.
6. How can an appeal be made to the eye in teaching Division of Fractions? Why should Fractions be taught before Proportion?

English.

1. Comment on :—
   Light was Gawain—Modred—Roman wall—Almesbury—Lyonesse—phantom circle—rolling year—old ghosts—wan wave.
   Analyse and parse all the verbs in 'Coming of Arthur,' lines 177–191.
2. How does the play of *Macbeth* exhibit the great powers of the dramatist?
   Explain :—
   'I will . . .
   Acquaint you with the perfect spy of the time,
   The moment on't.'
3. Comment on :—
   'If Portia is the beauty of this play, Shylock is its strength.'

MEN ONLY.

Algebra.

1. All of First Year.
2. If three $+^{ve}$ quantities be in A.P., the ratio of the first to the second is less than that of the second to the third.
   The difference of the logs. of successive integers continually diminish; why is this?
3. Prove the formula for ${}_nP_r$.
   Having five sovereigns and five shillings in my pocket, I am asked for a subscription; between how many different amounts have I choice?

Geometry.

1. All of First Year.
2. Prove IV., 13.
3. Prove VI., 4.
   Divide a given line internally or externally in the ratio of two given lines m, n.

WOMEN ONLY.

Needlework.

1. Cut out and make up a yoked muslin pinafore for a child of three.

Domestic Economy.

1. All First Year.
2. Describe all the facilities offered by the Post Office for saving and provision for old age.
3. Describe all the means of ventilation you are acquainted with.

OR,

1. As First Year.
2. Prove I. 44.
   Construct a rectangle equal to the sum of two given rectilineal figures.

SYLLABUS OF WORK FOR THE MONTH.

Students are advised not only to get up the work indicated, but also to use the test questions as indications of work to be got up and afterwards written out.

FIRST YEAR.

School Management.

1. Oral and written examinations, relative advantages and disadvantages.
2. Qualities of a good reading book.
3. Qualities of good reading.
4. Teaching time in music.

Composition.

1. Trades and Professions.
2. Poetry of Stuart Period and that of the Nineteenth Century.
3. Queen's Reign.
4. Relief of the Poor.

Arithmetic.

Not less than six examples from miscellaneous sets ought to be worked per week, as well as those on the particular work set and the examination questions given.

1. Pars. 269–271, especially the note P.
   Appendix on H.C.F. and L.C.M. fractions.
2. Pars. 273–280, P.
   Examination papers, 1–14.
3. Pars. 281–289, P.
   Appendix on H.C.F. and L.C.M. fractions.
4. Pars. 290–293, P.
   Examination papers, 15–28.

Music.

1. Time—accent—pulse-names.
2. Scales and Key signatures—Bridge notes.
3. Musical terms—(force or intensity).
4. Division of pulses—metronome.

English.

1. Scandinavian element in English.
2. Syntax of the noun.
3. Latin element in English.
4. Syntax of the adjective.

Literature.

1. Œnone.
   The Spectator.
2. Labour and Exercise.
   Notes on Tennyson given in 'P.T.'
3. The Revenge.
   Biography of Addison.
4. Idle Squire.
   Notes on Tennyson given in 'P.T.'

Geography.

1. Niger problem.
2. Cape Colony.
3. Modern partition of Africa.
4. The Sudan.

History.

1. Edward IV.
   Pitt—Burke.
2. War with France, 1793–1802.
   Caxton—Warwick.
3. Richard III.
   Hastings—Clive.
4. Ireland under Pitt.
   De la Pole—Black Prince.

1. Army and Parliament.
   Argyle—Hollis.
2. Presbyterians and King.
   Whiggamore Raid—Council of Adjutators.
3. Army and King.
   Covenanters—Malignants.
4. Second Civil War.
   Ireton—Confession of Faith.

MEN ONLY.

Algebra.

1. Square Root and Surds.
2. Ratio and Proportion.
3. Variation—H.C.F.
4. Mensuration of the circle.

Geometry

1. Book I. 21–24.
   ,, II. 1 and 9.
   ,, III. 1–3.
2. Book I. 25–27.
   ,, II. 2 and 10.
   ,, III. 4–6.
3. Book I. 28–32.
   ,, II. 3 and 11.
   ,, III. 7–9.
4. Book I. 33–36.
   ,, II. 4 and 12.
   ,, III. 10–12.

WOMEN ONLY.

Needlework.

Pattern on sectional paper of infant's shirt.
Various stitches used in making up.

Domestic Economy.

1. Breathing.
2. Materials used in clothing.
3. Symptoms of infantile diseases.
4. Cost of keeping clothes.

OR, *Geometry.*

Revise Axioms.
,, Prop. 6–10 and riders thereon.

SECOND YEAR.

Composition., *Music.*, *Arithmetic.*, *Geography.*, *History.* — As First Year.

School Management.

1. First two weeks of First Year.
   Memory and its cultivation.
2. Fitch, III.
   Definition—Syllogism.
3. Second two weeks of First Year.
   Faculties and their development.
4. Fitch IV.
   Classification—Conversion.

English.

1. First two weeks of First Year.
   'Merchant of Venice,' Act I., Scenes 2, 3.
2. 'Macbeth,' Act II., Scenes 3–5.
   'Coming of Arthur, 1–100.'
3. Second two weeks of First Year.
   'Merchant of Venice,' Act II., Scenes 1, 2.
4. 'Macbeth,' Act I., Scenes 6, 7.
   'Passing of Arthur,' 1–100.

MEN ONLY.

Algebra.

As First Year.
1. Logarithms—proofs and examples.
2. Binomial Theorem.
3. Interest and Annuities.
4. Binomial Theorem.

Geometry.

As First Year.
1. Book IV. 10.
   ,, VI. 19.
2. ,, IV. 11.
   ,, VI. 20.
3. ,, IV. 12.
   ,, VI. 21.
4. ,, IV. 13.
   ,, VI. 22.

WOMEN ONLY.

Needlework.

As First Year.
Stitches—Feather stitching—button hole front of night dress.

Domestic Economy.

As First Year.
1. Dishes for sick and methods of preparation.
2. Nursing, and suitable food for particular diseases.
3. Investments and Savings.
4. Housemaid's duties.

OR, *Geometry.*

As First Year.
Also Propositions 45–48.

QUERY COLUMN.

RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the *coupon* which appears on the back wrapper of the current number of the Journal.
3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Hopeful.—A is half as good again a workman as B. They are engaged to finish a work in 12 days, but finding in half the time that they cannot finish the work as agreed upon, they call in C to help them, and it is finished in the stipulated time. The time in which A and C could together do the work is to the time in which B and C could do it, as 7 : 8. How long would it have taken to do the work if C had worked from the first? Ans. 9 days.

Let p represent B's day's work,
and q ,, C's ,, ,,
then $\frac{3}{2}p$,, A's ,, ,,

Also $(\frac{3}{2}p + q) : (p + q) :: 8 : 7$;

$\therefore 10\frac{1}{2}p + 7q = 8p + 8q$,

or $2\frac{1}{2}p = q$.

In 6 days the work done by A and B $= 6(\frac{3}{2}p) + 6p = 15p$.

In next 6 days the work done by A, B, and C

$= 6(\frac{3}{2}p) + 6p + 6(2\frac{1}{2}p) = 30p$.

The total work is represented by $45p$, and since A, B, C, when working together do $30p$ in 6 days, they would do $15p$ in 3 days, and would therefore do the whole work in 9 days.

Stockhampton.—A person buys 6 per cent. bonds, the interest on which is payable yearly, and which are to be paid off at par 3 years after the time of purchase; if money be worth 5 per cent., what price should he give for the bonds?

Ans. £103 6s. 10·26d.

The answer which you give assumes simple interest.

The man pays down a certain fixed sum, viz., the price of the bond. In return for this he receives £6 at the end of one year, £6 at the end of two years, and £6, together with £100, at the end of the third year. Find the present value (assuming simple interest at 5 per cent.) of each of these amounts; then the sum of the three present values will give the price which should be paid.

Present value of £6 payable at end of one year

$$= \frac{6 \times 20}{21} = £5\ 14s.\ 3{\cdot}428d.$$

Present value of £6 payable at end of two years

$$= \frac{6 \times 20}{22} = £5\ 9s.\ 1{\cdot}090d.$$

Present value of £106 payable at end of three years

$$= \frac{106 \times 20}{23} = £92\ 3s.\ 5{\cdot}739d.$$

Adding these, we get £103 6s. 10·26d. Ans.

J. C.—A field of 70 acres was rolled by a roller 11 ft. in circumference, and 3 ft. 6 ins. in width, and another field of 63 acres was rolled by a roller 10 ft. 6 ins. in circumference, and 3 ft. 4 ins. in width. The larger roller revolved at the uniform rate of 9 revolutions in 25 seconds. Assuming that all the ground was rolled only once, in how much less time did one roller do its work than the other?

The problem is not definite enough. We shall assume that the horse which pulls the rollers walks at the same speed in the two cases; from this point of view the 10 ft. 6 ins. is not required. Had the time of one revolution of the roller been given, then we should have had to use the 10 ft. 6 ins.

Area rolled over in one revolution of larger roller

$$= 3\tfrac{1}{2} \times 11 = \tfrac{77}{2} \text{ sq. ft.}$$

Total area to be rolled $= 70 \times 43560$ sq. ft.

Hence total number of revolutions $= \frac{70 \times 43560 \times 2}{77}$.

Now one revolution is made in $\frac{25}{9}$ seconds

$$= \frac{25}{9 \times 60} = \frac{5}{108} \text{ minutes.}$$

∴ Total time occupied in rolling field

$$= \frac{70 \times 43560 \times 2}{77} \times \frac{5}{108} = 3666\tfrac{2}{3} \text{ minutes.}$$

Time taken to roll the second field

$$= 3666\tfrac{2}{3} \times \frac{63}{70} \times \frac{3\frac{1}{2}}{3\frac{1}{3}} = 3465 \text{ minutes.}$$

Therefore the second rollers takes $201\frac{2}{3}$ minutes less than the first.

J. H. Sargent.—A, B, C, run a mile race, B has 85 yards start, and C has 150 yards; $3\frac{1}{2}$ minutes after the start B passes C, and half a minute later A passes C; 200 yards beyond the spot where A passed C he passes B; when C is 100 yards from the winning-post, he increases his pace by 6 feet a second; which will win? and what will be the position of the other two when the winner passes the winning-post.—(From Oxford Senior, July 1894.)

Before B can overtake C he must gain 65 yards on C; this he does in $3\frac{1}{2}$ minutes, hence B gains on C at the rate of $\frac{65}{3\frac{1}{2}}$ or 20 yards a minute. For a similar reason A gains on C at the rate of $\frac{150}{3\frac{1}{2}}$ or 40 yards a minute; hence A gains on B 40 − 20 or 20 yards a minute. Now before A can overtake B, he must gain 85 yards on B, hence it takes him $\frac{85}{20}$ or $4\frac{1}{4}$ minutes to do this; therefore the 200 yards referred to must be run by A in $4\frac{1}{4} - 3\frac{1}{2}$ or $\frac{1}{4}$ minute, hence A runs at the rate of 400 yards a minute. From this it follows that B's speed is 380, and C's 360 yards a minute.

Now where are A and B when C is 100 yards from the winning-post? Well, C has actually run 1660 − 150 or 1510 yards, and this has occupied $\frac{1510}{360}$ minutes; therefore B has run $\frac{1510}{360} \times 380$, or $1593\frac{8}{9}$ yards; his distance from the end must be $1760 - (1593\frac{8}{9} + 85)$, *i.e.*, $81\frac{1}{9}$ yards. Similarly A has run $\frac{1510}{360} \times 400$, or $1677\frac{7}{9}$; hence his distance from the end is $82\frac{2}{9}$ yards.

Now C's speed is increased by 120 yards a minute, hence would take him $\frac{100}{480}$ or $\frac{5}{24}$ of a minute to reach the winning-post. Similarly it would take A $\frac{82\frac{2}{9}}{400}$ or $\frac{37}{180}$ minutes, and B $\frac{81\frac{1}{9}}{380}$ or $\frac{73}{342}$ minutes. It will be seen that A wins, for $\frac{37}{180}$ is the smaller of the three fractions.

B's distance from the winning-post will be $(81\frac{1}{9} - \frac{37}{180} \times 380)$, or 3 yards. C's distance will be $100 - \frac{37}{180} \times 480$, or $1\frac{1}{3}$ yards.

F. Pritchard.—Will you please state from what source your last query was taken?

Tim.—Solve the set of simultaneous equations,

$$\frac{x}{y} + \frac{y}{x} = a + \frac{1}{a}.$$

$$\frac{y}{z} + \frac{z}{y} = b + \frac{1}{b}.$$

$$x + y + z = c.$$

The left hand side of the first equation may be written either

$$\frac{x}{y} + \frac{1}{\frac{x}{y}} \text{ or } \frac{y}{x} + \frac{1}{\frac{y}{x}}.$$

Obviously, then, the first equation is satisfied by

$$\frac{x}{y} = a \quad (1); \text{ also by } \frac{y}{x} = a. \quad (2)$$

Similarly the second equation is satisfied by

$$\frac{y}{z} = b \quad (3); \text{ and by } \frac{z}{y} = b \quad (4).$$

From (1), $x = ay$, and from (3), $z = \frac{y}{b}$.

Substituting these values of x and z in the third given equation, we get:—

$$ay + y + \frac{y}{b} = c, \text{ or } y = \frac{bc}{ab + b + 1}.$$

$$\therefore x = ay = \frac{abc}{ab + b + 1}, \text{ and } z = \frac{y}{b} = \frac{c}{ab + b + 1}.$$

We have obtained these values of x, y, and z, by taking (1) and (3) together. If we had taken (1) and (4) together, working in an exactly similar manner, we should have obtained a different set of values; another set with (2) and (3), and still another set with (2) and (4).

COPPER AND OYSTERS.—The quantity of copper contained in various species of oysters has recently been investigated by several workers. W. F. Lowe has found in a single oyster 0·4 grammes, about three quarters of a grain of copper. Some of the oysters examined were light blue in colour, others were a dark green, but copper was found to be present in both. They came from the Mumbles near Swansea. Dr. Charles Kohn has determined the amounts of both copper and iron present in various kinds of oysters by electrolytic methods. The green Marennes oyster contains about 0·4 mgm (·006 grain) of copper, which is regarded as the normal amount present in all oysters, white or green, and due to the hæmocyanin of the blood. Dr. Thorpe, however, finds that the green Falmouth oysters each contain on an average ·023 grains of copper, which falls to the normal amount on re-laying in another locality.

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NEW BACTERIAL DISEASES OF PLANTS.—Dr. Peglion has recently discovered a disease which attacks the stem of the hemp, causing disintegration of the tissues. It seems to be produced by an organism of the nature of a bacillus embedded in mucilage, and closely resembling the parasite of the mulberry known as *B. cubboniana*. Mr. E. F. Smith has also investigated for the United States government a disease to which the potato, the tomato, and the egg-plant are subject. He calls it 'brown rot,' and it appears to be due to a hitherto undescribed parasite which he names *Bacillus Solanacearum*. Though in several respects it resembles *B. tracheiphilus* and the form known as 'Kramer's bacillus,' it differs in several points from both. In the *Revue Mycologique* M. E. Roze has described several bacteria which cause diseases in the cultivated potatoes, viz. *Micrococcus nuclei*, *M. imperatoris*, *M. pellucidus*, which are always found in company with the scab, *M. albidus* and *M. flavidus*.

Our Science Section.

☞ **Subscribers requiring Explanations of Difficulties in any Branch of Science, or Advice upon Courses of Study, can obtain all help required by communicating with the Editor, and accompanying their query with the Coupon cut from this No.**

NOTES ON PHYSIOLOGY:

EMBRACING THE SUBJECTS OF THE ADVANCED AND HONOURS STAGES, SCIENCE AND ART DEPARTMENT.

BY WALKER OVEREND, M.A., M.D. (OXON), B.SC. (LONDON),

Physician to the Tottenham Hospital;
Late Radcliffe Fellow, Scholar of Balliol College, and Exhibitioner in Comparative Anatomy of the London University.

THE subjects of the blood, circulation, and respiration are extremely important, since the two first questions in the advanced papers almost invariably deal with these. We shall this month give a brief *résumé* of the circulation and the blood.

1. A cardiac *cycle* consists of first sound, second sound, and the pause. At the end of the pause the auricles contract, and this contraction is swiftly followed by the beat of the ventricles. As soon as the ventricles begin to relax, the semilunar valves come together and are rendered tight. When the valves are thus rendered tense the second sound occurs.

At the beginning of the period of relaxation of the heart, that is, the diastole or pause, the heart is soft and flaccid, and fills exactly the space in which it lies. During the pause, the auricles are filling with blood, and some of this passes right on at once into the ventricle. Then comes the sudden contraction of the auricle, which in the case of the right auricle begins as a swift wave from the mouths of the superior and inferior venæ cavæ. When the auricle contracts the blood does indeed try to get back into the veins, and a slight vibration or wave is conducted along the veins to the neck, and the time of this corresponds to the auricular systole and is termed a *venous* pulse. As the blood enters the ventricle during its diastole, a reflux of blood occurs which insinuates itself between the valves and the walls of the ventricle. It floats up the curtains of the valves into a position better adapted for their early closure. The ventricular systole now commences, and pressure is then brought to bear on the auriculo-ventricular valves, which, inasmuch as the papillary muscles continue in a state of contraction more effectually, closes the valves and prevents backward leakage At the commencement of the systole the semilunar valves are closed, and are kept closed by the arterial pressure within the aorta and pulmonary artery. As the contraction of the ventricle continues, the latter becomes as hard as a stone, but immediately the semilunar valves are burst open the strain diminishes a little and the hardness is less. When the systole is over, the elastic reaction of the arterial walls drives the blood in them a little backwards, fills out the pockets of the semilunar valves, the thin edges of the valves and the corpora arantii meet, and leakage is prevented. The ventricular systole ceases, the muscular walls relax, and the pause then commences. The same course of events takes place on each side of the heart simultaneously. For the change of form in the ventricle during systole, see 'Elements of Physiology,' by the Author, page 77, in Nelson's 'Manual of Domestic Economy.' The student is recommended to read this carefully.

The first sound of the heart is long and dull, the second is shorter and sharp. Much discussion has arisen with regard to the cause of the first sound. Three principal events occur with this sound, viz.:—

(1) The apex beat or impulse against the chest-wall;
(2) Contraction of the muscular fibres of both ventricles;
(3) Tightening of the auriculo-ventricular valves.

It has been demonstrated that the first sound is, in reality, double; along with the dull sound produced by the contraction of the muscular fibres, there is a higher sound due to the stretching of the valves.

2. Blood-pressure is another important question. It is measured by means of a U-shaped tube containing mercury, which is termed a manometer. To one limb is connected a leaden tube, which again communicates with a glass tube which has been tied into an artery (as the carotid) of a living animal. The leaden tube and the limb of the manometer in connection with it are filled with a strong solution of bicarbonate of soda in order to prevent coagulation of the blood. In the other limb of the manometer, which remains open, a float is placed on the surface of the mercury and registers the difference between the height of the mercury in the two limbs, and the variations of the pressure are also noted. The pressure in the carotid artery of man is estimated at 6 inches of mercury; in a large dog, perhaps 4 inches. Blood pressure may be defined as the force exerted by the blood upon the walls of the blood-vessels. The causes of arterial pressure are—

(1) The action of the ventricles pumping into the arteries excess of blood;
(2) The resistance to the flow in the capillaries.
(3) The elasticity of the arteries.

The arterial pressure is affected by various conditions—

(1) Increased strength of the ventricles would, other things being equal, increase the arterial pressure;
(2) Dilatation of the smaller arteries and capillaries lowers the arterial pressure;
(3) The movements of inspiration and expiration influence respiration as already described;
(4) Muscular exercise sends more blood towards the heart and increases the arterial pressure.

The arteries are always more or less over-distended, and their elastic walls are ever striving to regain their equilibrium. In so doing they react on the blood, and help in driving it onwards. This state of distension is, in fact, the arterial pressure, and, as such, is a most important factor in the maintenance of the circulation.

3. *Venous and Arterial Blood.*—The differences are mainly dependent on the composition of the gases which are obtainable by means of the air-pump. From 100 volumes of blood, about 60 of gas are evolved in a vacuum. In arterial blood about 20 of these is oxygen and 40 carbon dioxide. In venous blood, the amount of oxygen may be less than one-half that of arterial, while the carbon dioxide is increased. Venous blood is darker in colour, because some of the oxyhæmoglobin is reduced to simple hæmoglobin. Outside the body this change in colour may be artificially produced. If blood be shaken up in a wide test tube, it takes up oxygen from the air and becomes more scarlet. If now a solution of ferrous sulphate, made alkaline with ammonia, be added, the blood becomes dark purple, inasmuch as the sulphate of iron seizes upon the oxygen of the oxyhæmoglobin and reduces it to simple hæmoglobin, which has a purple colour. Hæmoglobin is the most important constituent of the red blood corpuscle. It is a chemical substance, which crystallises, and is soluble in water. It readily combines with gases such as oxygen, and in this instance produces oxyhæmoglobin which is scarlet in colour. Oxyhæmoglobin is an unstable chemical combination; it loses its oxygen with great facility. In the body, the tissues have a greater affinity for oxygen than hæmoglobin, and the latter therefore loses oxygen and becomes purple. When it reaches the lungs, the venous blood becomes spread out over the air sacs, and is there exposed to an atmosphere containing oxygen. The hæmoglobin appropriates the latter, and the venous blood becomes arterial. The carbon dioxide, like the oxygen, is not simply dissolved in the blood, but it is to some extent combined with the sodium carbonate present in the plasma.

4. Give an account of the coagulation of the blood and of the conditions which accelerate and retard it; also of the theories relating to it.

For coagulation read Chapter VI. in 'Elements of Physiology.' A blood clot consists of fibrin with red corpuscles. The serum consists of plasma minus fibrin. Conditions which accelerate the coagulation are contact with foreign matter of all kinds; the

addition of certain salts, as calcium chloride, exposure to air and moderate temperature of about 60° centigrade. Conditions which retard coagulation are exposure to cold, as freezing—the addition of strong solution of sulphates of potassium, sodium and magnesium, glycerine, oil, etc. For the theory of coagulation read Chapter VI., before mentioned.

5. The nervous mechanism of respiration is also very important.

There is a centre, and connected with it are afferent and efferent nerves. The respiratory centre lies in the medulla where the vagi nerves enter.

Afferent nerves are (1) the vagi,
(2) the cutaneous nerves.
Efferent nerves are (1) phrenic to diaphragm,
(2) intercostal nerves,
(3) nerves to scaleni, levatores costarum, etc.

If one vagus be cut, there is not much effect; if both, the respirations become deep and slow. The branches of the vagus going to the alveoli are the chief regulators of breathing, and this is effected by a mechanical stimulation acting on the branches of these nerves and produced by the alternate dilatation and collapse of the air-cells themselves. The respiratory centre is stimulated by a deficiency of oxygen in the blood circulating through the medulla oblongata. The effect of exercise is probably to increase the acidity of the blood passing to the respiratory centre, which excess of acidity stimulates it to increased activity.

CHEMISTRY NOTES.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),

First Class Honoursman in Chemistry (Science and Art Department), Head Master, Finchley Organised Science School, and Lecturer therein on Chemistry.

The formation of dithionic acid in the oxidation of sulphurous acid by potassium permanganate.—T. S. Dymond and F. Hughes. At the last meeting of the Chemical Society the above was the subject of a paper couched in the following strain:—'When a solution of sulphurous acid is titrated with a solution of potassium permanganate, decolourisation of the permanganate ceases when only 99 per cent. of the quantity required to oxidise the sulphurous acid to sulphuric acid has been used. This is due to the formation of dithionic acid in addition to sulphuric acid. The proportion of dithionic acid produced is constant, and is not influenced either by the dilution or by the temperature, or by the acidity of the solution. Its production, therefore, seems to be an essential part of the reaction, and to be due to the weak oxidising action of the permanganate in a final stage of its reduction. The sulphuric and dithionic acids produced are in the proportions required by the supposition that manganese heptoxide is first reduced to the red oxide with production of sulphuric acid, and further reduced to the monoxide with the production of dithionic acid. When, however, sulphurous acid is treated with the red oxide, sulphuric acid is the only product.'

On the spectrographic analysis of some commercial samples of metals, of chemical preparations, and of minerals from Stasfurt Potash Beds.—This is the title of a paper read before the Chemical Society by Professor Hartley, whose paper on the wide-spread occurrence in small quantity of the rare elements we reproduced last month.

Samples were examined of Steel made at Middlesbrough from the blast furnace metal smelted from Cleveland clay ironstone, and rolled into rails; of alumina and red mud separated from bauxite at the British Aluminium Company's Works at Larne, and of the aluminium prepared from the alumina at Foyers, and of various commercial alums.

It is shown that of the constituents of the blast furnace metal, the alkali metals, calcium, copper, silver, gallium, manganese, and lead are present also in the steel, but the chromium and nickel have been removed.

Of the constituents of bauxite, traces of sodium, potassium, calcium, copper, silver, gallium, iron, manganese, and lead are found in the metallic aluminium. These elements are also present in larger quantity in red mud, and, in addition, nickel and chromium are present.

The Alums.—Examined directly by heating 0·5 grams of the dried sample in the oxyhydrogen flame, sodium potassium, rubidium, calcium, and thallium are found as common constituents, and copper, gallium, iron, and nickel as occasional constituents. More interesting results were obtained by examining the precipitates produced by potassium ferrocyanide in solutions containing 50 grams of the alums strongly acidified with HCl. These precipitates contained the elements sodium, potassium, rubidium, caesium, copper, silver, calcium, gallium, thallium, nickel, manganese, besides iron which was also present in the acid radical. The rubidium, caesium, gallium, and thallium lines are strong in some of the spectra, and the results indicate that these elements are almost wholly precipitated by this process. A sample of aluminoferric from Messrs. Spence & Sons, Manchester, contained all the elements found in the alums, but in much larger quantities. Of these elements the pyrites furnishes the thallium, and also traces of indium found in a bye-product of the manufacture of alum, whilst the other elements were traced to the aluminous material, bauxite and shale. The shale was richer in alkalis and gallium than the bauxite, but a sample of French bauxite was richer in silver and lithium than either Irish bauxite or shale. Samples of Stasfurt minerals were examined in the course of the investigations, and were found to yield spectra containing no lines of rubidium, caesium, gallium, or thallium. These salts gave only weak lines of a few elements besides the lines of the principal elements composing them.

It is pointed out in the paper that the elements found by their spectra actually exist in the specimens, as there is no possibility of their being accidentally introduced; and furthermore, substances have been examined which have given no trace even of such widely distributed elements as potassium and calcium, and in which the "D" lines are very weak.

The systematic examination of railway metal by such an analytical method as is here employed might lead to results of practical importance. The method reveals the presence of small quantities of metals such as copper, silver, gallium, and lead, which have not been considered in dealing with commercial irons, and the influence of which upon the physical properties of these have not been considered.

Magnesium Nitride as a Reagent.—Dr. H. Lloyd Snape. The object of Dr. Snape's paper was to investigate whether magnesium nitride could be utilised to introduce nitrogen in the place of oxygen, chlorine, and other negative elements which combine with magnesium. The author investigated the behaviour of magnesium nitride towards chloroform, carbon trichloride, &c. In no case was the desired nitrogenous compound obtained. With chloroform at high temperatures, the following reaction took place:—

$$2\,CHCl_3 + Mg_3N_2 = 3\,MgCl_2 + C_2 + N_2 + H_2.$$

Observations upon the Oxidation of Nitrogen Gas.—By Lord Rayleigh, F.R.S. On the basis of Davy's assertion that the dissolved nitrogen of water is oxidised during electrolysis, various attempts were made, but they led to no useful result, even leaving it doubtful whether Davy's facts are correct.

The influence of pressure upon the oxidation of nitrogen by the electric flame was next examined. It appeared that, while in a small vessel the effect of increased pressure was favourable, but little advantage resulted when the vessel was large enough to give the maximum effect of a given pressure. The pressures compared were: one[2] atmosphere, two[1] atmospheres, and three[1] atmospheres. It is then shown how in a large apparatus 21 litres of mixed gases enter into combination per hour, at an expenditure of about one horse-power.

Hypoiodous Acid and Hypoiodites.—Mr. R. L. Taylor, F.C.S., has recently done some useful work on these bodies. He confirms and extends the observations of Schönbein, using, as he did, an *aqueous solution of iodine*. When a little alkali is added there is practically no iodate formed, from 90 to 95 per cent. of the iodine undergoing the reaction represented by the equation

$$2\,KOH + I_2 = KI + KIO + H_2O.$$

This is proved by the bleaching action upon a standard solution of indigo, and also by Schwickar's method of decomposing the hypoiodite by a carbonate or by carbonic acid.

The solution bleaches indigo much more rapidly than chlorine or hypochlorites, but does not bleach litmus. It gives a precipitate with Co $(NO_3)_2$ which blackens on standing, and an immediate brown precipitate with manganous salts and lead salts. Stronger solutions are obtained by using iodine water containing a little suspended iodine. All the solutions are decomposed completely by boiling for three or four minutes. The author concludes that the reaction represented above, as Walker and Ray have also recently stated, is a balanced one. He has repeated Lunge and Schoch's experiments, who obtained by the action of iodine upon lime, in the presence of comparatively little water, a bleaching liquid which stood being boiled for hours without being decomposed. He concludes that their observations were practically only correct so far as they agreed with those of Schönbein. The author has also investigated the action of precipitated mercuric oxide upon iodine water, and finds that hypoiodous acid is formed. The filtered (colourless) solution

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possesses only the feeblest possible bleaching properties, but the addition of a little alkali transforms it at once into as strong a bleaching solution as Schonbein's, which it now exactly resembles. By the methods mentioned above it is found that from 40 to 45 per cent. out of a possible 50 per cent. of the iodine used exists in the solution as hypoiodous acid. By using iodine water and a little suspended iodine a stronger solution is obtained, which very soon decomposes—turning brown—owing to the liberation of iodine. The hypoiodous acid probably decomposes as follows :—

$$3\,HIO = 2\,HI + HIO_3,$$

and the hydriodic acid and iodic acid immediately decompose each other with the liberation of iodine. The author suggests a possible explanation of the feeble bleaching power of the free acid in the instability of the hydriodic acid which will be left compared with the alkaline iodides.

A solution containing hypoiodous acid also appears to be formed by the action of various silver salts upon iodine water ; the best results being obtained with silver nitrate and silver carbonate. These liquids bleach much more rapidly than the one described above, probably because of the silver which is present ; but they are much less rapid in their bleaching action than the alkaline hypoiodites. In other respects they resemble Schönbein's solution, being, however, much less stable, this again being probably due to the presence of silver in the solution. The liquid obtained by adding a few drops of silver nitrate to aqueous iodine loses 90 per cent of its bleaching power in five minutes.—*Chemical News.*

NOTES ON PHYSIOGRAPHY.

The Equatorial and Polar Diameters of Mars.—From observations made last December, Professor Schur finds that the equatorial diameter of Mars varied from 6·210″ to 6·310″, and the polar diameter from 6·125″ to 6·135″. In these determinations Professor Schur made use of the Rebsold heliometer.

Rotation Period of Venus.—This vexed question is still unsettled, and it is uncertain whether Venus rotates in 23 h. 24 m., or whether the period of rotation synchronises with that of revolution, in which case it would be 225 days. Niester, Trouvelet, and Brenner consider that the rotation period must be short, approximately 24 hours ; whereas Cerulli, Perrobin, and Tenby incline to the opinion of Schiaparelli, who contends that synchronism between rotation and revolution is undoubted. Mr. Percival Lowell, whose work on Mars has recently aroused so much attention, subscribes to this view also.

Capture of a Meteorite.—Of the many meteorites that periodically fall upon our earth but few are ever obtained possession of by man. An observer at Albina, in Oregon, recently had the good fortune to recover one of these stones under the following circumstances :—One evening, at about 10.30 p.m., he perceived in the air what seemed to be an incandescent ball which left behind it a train of bluish-white particles. Under the very eyes of the observer the ball fell and dug itself into a heap of cinders and coal. There it remained still at a white heat. It was recovered, and upon cooling ceased to emit the disagreeable odours that had characterised it when first taken out of the earth. The meteorite is small and irregular in shape ; as to its composition nothing as yet has been determined, no analysis having been made up to the time of writing.

Procyon's Satellite.—Mr. Schaeberle, at the Lick Observatory, discovered a satellite of Procyon on the 13th October. It can be seen only with great difficulty, partly on account of its vicinity (4·6″) to its brilliant primary, and partly on account of the little light that emanates from it. Arguing from the perturbations of Procyon caused by this satellite, its mass has been estimated as one-fifth of that of the bright star that constitutes its primary.

Size of present Sun Spot.—In answer to a querist, E. W. Maunder gives in *Knowledge* the following details concerning a sun spot that has been visible since January 25th. 'The group consists mainly of an approximately circular spot nearly three degrees of solar latitude in diameter, or 21,400 miles, its area being 360,000,000 of square miles. At various distances from the main spot are several smaller spots ; total area 80,000,000 of square miles. The extreme length of the group of spots is 56,000 miles.'

Oxygen in the Sun.—In the *Astrophysical Journal* for February, Mr. Lewis E. Powell contributes the following interesting article disposing of the contention of Messrs. Runge and Perchen, who claimed that three lines in the solar spectrum, viz. at λ7772·20, 7774·43, and 7775·62 (Higg's map), were due not to atmospheric but to solar oxygen. 'At noon of December 24th, with the sun at an altitude of 27°, the lines at λ7772·20 and 7774·43 (the strongest lines of the supposed oxygen triplet) were weaker than the lines in the 15th pair in the tail A (due to atmospheric oxygen); near sunset, when the sun's altitude was 4°, the lines in question were stronger than those in the 14th pair of A ; the sunlight at the last observation passed through five times as much atmosphere as during the former observation, and the lines of atmospheric oxygen had correspondingly increased in intensity.' As these comparisons show that the suspected lines had increased much more in intensity than those of the atmospheric oxygen used for comparison, it was evident that the suspected lines were unquestionably produced in the earth's atmosphere, but could not be due to atmospheric oxygen. Comparisons were also made with the solar line at λ7699·1 ; and while the suspected lines were very much weaker than the solar lines at noon, near sunset they were stronger.

On December 31st the air was warm and very moist. With the sun at an altitude of 27°, the lines were weaker than those of the 14th pair of A, and stronger than those of the 13th pair of A. Observations made later in the afternoon showed that the lines were becoming relatively stronger ; but the air was getting hazy and the spectrum weak, so that no reliable estimates could be made, though the lines could be seen until the sun was about 5° from the horizon.

On January 4th an observation was made with the sun at an altitude of 27° 30′, and the lines in question were stronger than the 14th pair of A, but weaker than those of the 13th pair. Observation upon known water vapour lines showed the humidity of the air to be greater than upon December 31st. Clouds however prevented any further observations, but those already made prove conclusively that **the three lines supposed to be due to oxygen in the sun are produced by water vapour in the earth's atmosphere.**

Weather in 1896.—The *Observatory* for March, over the initials 'L.C.N.,' gives the following terse summary of some of the more salient characteristics of the weather of the past year. 'The monthly mean temperatures, as determined at the Royal Observatory, Greenwich, from January to July, were in all cases in excess as compared with the 50 years averages, to the mean amount of 2·4°, whilst the remaining months were usually below average value by small amounts. The mean annual temperature was 50·1°, being 0·7° above the average. Rain fell on 161 days, which is about an average number, whilst the year's rainfall, 24·42 inches, is only 2·12 inches below its corresponding average, the liberal downpour in September amply compensating for the drought which marked the earlier part of the year. In the 20 years, 1877–1896, there is a total deficiency of rainfall, as compared with the average, amounting to rather more than 5 inches. With regard to the wind, a preponderance of winds from N. and N.E. was experienced in May, and N. again in August, and N.E. in November ; whilst the S.W. wind preponderated in March, September, and October, and was almost entirely absent in May. In the year the N. wind prevailed on 64 days, and the W. wind on 61 days, which numbers are respectively 21 and 18 days above the usual degree of prevalence. The S.W. wind with 88 days, and the S. wind with 28 days are, on the contrary, 17 and 13 days respectively below the average amounts.'

Carbon in Bright Line Stars.—A recent correspondence in *Nature* has taken place between Professor Lockyer and Dr. Huggins, the purport of which may be gathered from what follows.

Professor Lockyer.—In the spectrum of the Bunsen flame is a group of carbon flutings, with their maximum at 4,737. In the spectrum of comet III. 1881, Vogel found a blue band with maximum at 470. This he attributed to carbon, and gave a diagram of another carbon spectrum, showing a band of the same form and position as that of the comet. A band has been recorded by various observers in bright line stars at places varying from 468 to 469. Professor Lockyer, having overlooked Vogel's paper, sought for the origin of this, and found that under some conditions of temperature and pressure the maximum of the 4,737 carbon band was shifted to 4,685. Hence he attributed the stellar band to carbon. Dr. and Mrs. Huggins, relying on some experiments by Hasselberg, do not admit that the observed variations in the carbon spectrum are sufficient to justify the conclusion. There are also two groups of green flutings in the carbon spectrum. These are the chief characteristics of the spectra of comets at mean distance from the sun. Vogel and Lockyer have obtained indications of similar flutings in bright line stars, but they are very difficult, being projected on the brightest part of the continuous spectrum, and very much weakened by high dispersion. Dr. and Mrs. Huggins do not admit their existence. Campbell finds in some stars a bright band about 465, sometimes associated with that which he places at 4,688, sometimes alone. A band at about the same

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position was observed in Brorsen's comet in 1869 and 1879. Professor Lockyer suggests that this may be due to in some hitherto untried condition. The conclusion is that the idea of the chemical and physical kinship of comets, nebulæ and bright line stars is strengthened by the arguments now adduced.

Dr. Huggins.—In reply to Professor Lockyer, Dr. Huggins writes that the variations in the position of the maximum brightness of the blue carbon band were fully discussed by him, but that those variations do not affect the range of X wave length. Of the three Wolf-Rayet stars in Cygnus examined by Dr. and Mrs. Huggins, in two stars the bright band lies outside the region of the carbon band; and, in the third, though the maximum falls near its limit, a large part of the star band falls outside the carbon band. The band has a different position in each of the three stars.

Carbon also has bright bands in the green and orange. There are bright bands in these parts, and the spectrum of the stars which are well seen upon the continuous spectrum, but careful comparison shows that they have no connection with the carbon flutings. Professor Campbell has measured their place recently; he makes no suggestion as to the presence of carbon, though he does, with caution, suggest magnesium.

Professor Vogel has nowhere identified the blue bands of the Wolf-Rayet stars with the spectrum of carbon.

MATHEMATICS.

STAGES 2 AND 3, SCIENCE AND ART DEPARTMENT.

BY G. A. BAXANDALL,

Assistant, Mathematical Division, Royal College of Science, London.

STAGE 2.

Algebra.

50. Simplify the following expression:—

$$\left(\frac{a^2+b^2}{a^2+ab+b^2}+\frac{a^2-b^2}{a^2-ab+b^2}\right)\div\left(\frac{a^2+b^2}{a^2+ab+b^2}-\frac{a^2-b^2}{a^2-ab+b^2}\right).$$

Ans. $\dfrac{a^4+a^2b^2-ab^3}{b^4+b^2a^2-ba^3}$

51. Extract the square root of—

$$9\left(\frac{x^2}{y^2}+\frac{y^2}{x^2}\right)-24\left(\frac{x}{y}+\frac{y}{x}\right)+34,$$

and resolve into elementary factors—

$$m^4-n^4+2n(m^3+n^3)-(m+n)^2(m-n)^2.$$

Ans. $3\left(\frac{x}{y}+\frac{y}{x}\right)-4$; $2m^2n(m+n)$.

52. Form the equation whose roots are the reciprocals of those of the equation $(x+5)^2-4x=160$. Ans. $135x^2-6x-1=0$.

53. A and B start on a walking match round a circular course at the same time from opposite points. After half an hour they are both in their original positions, A having gone round three times, and B four times. Assuming that each walks with uniform speed, when and where will B next overtake A?

Ans. In 15 minutes, when B has gone exactly twice round.

54. Show that there is only one value of x which makes $x^3+3cx^2+2c^2x+5c^3$ equal to the cube of $x+c$, and find it.

Ans. $x=4c$.

55. Simplify—

$$\sqrt[11]{\frac{\left(\sqrt[3]{a^4b^2c}\right)^3\left(\sqrt{a^3b^2c}\right)^{11}}{a^{\frac{5}{11}}}}$$

Ans. a^3b^2c.

56. The product of two expressions is—

$$(x+y)^3+3xy(1-x-y)-1,$$

and one is $x+y-1$, find, without division, the other.

Ans. $x^2-xy+y^2+x+y+1$.

57. (*a*) Find a mean proportional to $2\frac{1}{2}$ and $5\frac{1}{2}$, and a third proportional to 100 and 130.

(*b*) If $a:b::c:d$, show that—

$$a:a+b::a+c:a+b+c+d.$$

(*c*) If a crew, which can row from Westminster to Battersea in 30 minutes, can row from Battersea to Westminster in 25 minutes, compare the rates of the stream and of the boat.

(*d*) If x have to y the duplicate ratio of $x+z$ to $y+z$, prove that z is a mean proportional between x and y.

Ans. $\frac{+3}{14}$; 169 : 1 : 11.

Trigonometry.

64. (*a*) What do you understand by a *radian* or unit angle in circular measure? A certain portion of the circumference of a circle is $2\frac{1}{2}$ times the radius, how many radians are there in the angle subtended by this arc at the centre?

(*b*) A man walks $\frac{1}{4}$ mile round a circular track, and it is found that this portion subtends at the centre an angle of $2\frac{1}{2}$ radians; how many times must he go round before walking 10 miles, and what is the radius of the track? Take $\pi=\frac{22}{7}$.

Ans. $2\frac{1}{2}$; 14; 200 yards.

65. Describe a circle, centre O, and draw a vertical and horizontal diameter, the horizontal radius to the right being OE. A radius, starting from OE, rotates through angle POE of, say, 23° 35′; draw PM perpendicular to OE. Suppose now that the radius continues to make one rotation, you are required to draw those positions OP_1, OP_2, etc., of the revolving line, such that if perpendiculars P_1M_1, P_2M_2, etc., are drawn to OE or EO produced, the triangles P_1OM_1, P_2OM_2, etc., are equal in all respects to POM. What are the angles (reckoned from OE) corresponding to these positions? Obtain, for each angle, the value of the sine, cosine, and tangent, being given that sine 23° 35′ = 0·4. Be careful about the proper signs.

Ans. 66° 25′, 113° 35′, 156° 25′, 203° 35′, 246° 25′, 293° 35′, 336° 25′.

66. Which of the angles in Ex. 65 satisfy the equation $25\sin^2 A-4=0$; also which satisfy the equation $25\sin^2 B-21=0$?

Ans. 156° 25′, 203° 35′, 336° 25′; the remaining angles.

67. Determine the value of $\sqrt{\sin^2 23°\ 35'}$ (see Ex. 65), being given $\log 2=\cdot3010300$, $\log 6\cdot9314=\cdot840821$, $\log 6\cdot9315=\cdot840827$.

Ans. ·693145.

68. A blockader lies 10 miles S.W. of a harbour. Observing a vessel leave the harbour, it gives chase, and overtakes it after sailing 15 miles in a direction 23° N. of E. Towards what point of the compass was the vessel directing its course? Given $\log 2=\cdot3010300$, L tan 79° = 10·7113477, L tan 45° 49′ = 10·0123821, L tan 45° 48′ = 10·0121294. Ans. 10° 11′ 1″ S. of E.

69. Two angles of a triangle being 150°, 18° 21′, and the longest side 10,000 feet long, find the length of the shortest side. Given $\log 2=\cdot30103$, L sin 11° 40′ = 9·3058189, log 4·0444 = ·6868541, log 4·0443 = ·6868434. Ans. 4044·3514 feet.

70. If one angle A of a triangle be 60°, show that $(a+b+c)(b+c-a)=3bc$.

STAGE 3.

Algebra.

59. Find the limits of value between which x must lie in order that $4x^2+4x-1$ may be positive; and if x be real, prove that $\dfrac{2x-7}{2x^2-2x-5}$ can have no value between $\frac{1}{11}$ and 1.

Ans. x must not lie between $-\frac{\sqrt{2}+1}{2}$ and $\frac{\sqrt{2}-1}{2}$.

60. If a, b, c, d, be in Geometrical Progression, show that $(a-b+c-d)^2=(a-b)^2+2(b-c)^2+(c-d)^2$.

61. If 32 boys are drawn up in a line 4 deep, in how many ways can they be arranged so as to have a different set in the front rank each time? In how many ways if the first rank is always to include the 3 tallest?

Ans. $\frac{\lfloor 32}{\lfloor 8\ \lfloor 24}$; $\frac{\lfloor 29}{\lfloor 5\ \lfloor 24}$

62. (*a*) Write down the 5th term in the expansion of $(2+x)^7$, and find the greatest term when $x=3$.

(*b*) What term of $(1-x)^{\frac{1}{2}}$ is equal to $\frac{1}{13}$ of the same term of $(1+x)^{-\frac{1}{2}}$? Show that the coefficient of x in $(1-4x)^{-\frac{2}{3}}$ is $\frac{\lfloor 2r+1}{\lfloor r\lfloor r+1}$.

Ans. $280x^4$, 5th, 8th.

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63. If $S_1, S_2 \ldots\ldots S_p$ be the sums of infinite geometric series whose first terms are the first p numbers in succession, and common ratios $\frac{1}{2}, \frac{1}{3}, \ldots\ldots \frac{1}{p+1}$, prove that

$$S_1 + S_2 + \ldots\ldots S_p = (p+3)\frac{p}{2}.$$

64. (*a*) Find the sum of the coefficients of powers of x in the expansion of $(p+x)^6$.

(*b*) Find the cube root of 999 to 4 places of decimals.

Ans. $(p+1)^6 - p^6$; 9·9966.

65. There are two cricket clubs of 14 and 16 members respectively; how many different matches can they make, and in how many will two particular members, one out of each club, both play?

Ans. $\frac{\lfloor 14}{\lfloor 11 \lfloor 3} \times \frac{\lfloor 16}{\lfloor 11 \lfloor 5}$; $\frac{\lfloor 13}{\lfloor 10 \lfloor 3} \times \frac{\lfloor 15}{\lfloor 10 \lfloor 5}$.

66. If the expressions $ax^3 + bx + c$, and $a + bx^2 + cx^3$, have a common quadratic factor, prove that $a^2 - ab - c^2 = 0$; and when this condition is satisfied, find the factors of the expressions.

(See 'Query Column,' March.)

Trigonometry.

54. Given $\sin 224° = -·69$, find $\sin 112°$. Ans. ·928.

55. A perpendicular AD is drawn from the point A to the opposite side BC of any triangle ABC, show that its length is the harmonic mean between the lengths of the radii of the escribed circles which touch AB and AC not produced.

56. From D, a point in AC which is distant d from the angle C, a line is drawn cutting CB in E, and dividing the triangle, so that $2\triangle DCE$ = area DABE; show that the length of this line is

$$\left\{ d^2 + \frac{a^2b^2}{9d^2} - \frac{1}{3}(a^2 + b^2 - c^2) \right\}^{\frac{1}{2}}.$$

57. If $x^3 = \tan 123° 15' 20'' \cos 95° 42' 40''$, find x, having given L. tan 33° 15′ = 9·8166580, L tan 33° 16′ = 9·8169335, L sin 5° 42′ = 8·9970356, L sin 5° 43′ = 8·9982994, log 5·3338 = ·7270367, log 5·3339 = ·7270449. Ans. ·5333874.

58. ABC is a plane triangle, and P a point in AB, such that $\frac{AP}{BP} = \frac{m}{n}$. If $CPB = \theta$, prove that

$$(m+n)\cot\theta = n\cot A - m\cot B.$$

Also if ACP and BCP be α and β respectively, show that

$$(m+n)\cot\theta = m\cot\alpha - n\cot\beta.$$

59. Prove that in any triangle

$$ab\sin C(\cot A - \cot B) = b^2 - a^2.$$

60. Solve the equation $\sin 7\theta - \sin 3\theta - \sin\theta = 0$, giving the general value of θ.

Ans. $\theta = \frac{n\pi}{3}$, or $(6n \pm 1)\frac{\pi}{12}$.

THE PROTECTION OF THE POLLEN OF FLOWERS FROM RAIN.—Professor Hansgirg suggests a fourfold classification of flowers with regard to the protection of their pollen from rain.—(1) Flowers which close their perianth in rainy weather, so as to prevent the entrance of rain drops, without any change in the position of the flower. (2) Flowers with an erect flower-stalk which curves in wet weather so as to alter the position of the opening of the corolla and prevent the access of rain to the pollen and nectar. (3) Flowers in which the same purpose is served by the curving of the stalk of the entire inflorescence. (4) Flowers which are erect and open in fine weather, but during rain both close their perianth, and at the same time protect the pollen by a curving of the flower-stalk.

***

FOSSIL BACTERIA.—M. B. Renault has recently published the results of a long series of investigations undertaken by him with regard to the indications of bacteria found in geological strata. Bacteria appear to have been coeval with the first appearance of organic life on the earth, the coccoid form being apparently earlier than the bacillar. Indications of their presence are found in bone, teeth, scales, and coprolites, as well as abundantly in vegetable tissues, the spores and sporanges of fern appearing to have been specially subject to their attacks. As a rule, the fossil species of bacteria are distinct from those in existence at the present time.

NEW SCIENCE PUBLICATIONS.

MESSRS. BLACKIE AND SON, LONDON.

Fuel, by Professor Humboldt Seaton. This volume from the pen of the professor of metallurgy in the Glasgow and West of England Training College bears the impress of the enthusiast who knows his subject, and knows also how to enthuse others. From start to finish the treatment of the subject is masterly, and students who are interested in the philosophy of fuel and refractory materials will thank Professor Seaton for smoothing their path as he has done in the work under notice. The illustrations are plentiful and well executed. We do not hesitate to say that 'Fuel' is the best volume that has yet appeared in Messrs. Blackie's Science Series.

Earth Knowledge: Part II., by W. Jerome Harrison and H. Rowland Wakefield. This is the sixth and enlarged edition of Messrs. Harrison and Wakefield's Advanced Physiography. The enlargement has been necessary to bring the book into agreement with the Department's Syllabus. A book that has run through five editions must have plenty of good features, and certainly this is true of 'Earth Knowledge,' which within the narrowest compass gives all that is requisite to satisfy the minimum requirements of the South Kensington Syllabus. The treatment of rigidity is not satisfactory, as the student is led to believe that it is synonymous with hardness—a view not to be tolerated, since in wood we have a substance at once soft and rigid.

A Companion to 'Young Chemists': Standard V. This is an eminently practical little handbook to a Science Reader dealing with chemistry. To the teacher and to the happy children set to work out the experiments, the booklet cannot but prove invaluable.

MESSRS. W. AND R. CHAMBERS, EDINBURGH.

Chambers' Elementary Science Readers: Book III. The reader of this little Science Primer is presented with his science by a Fairy, who holds forth to an admiring and intelligent Princess. The discussion ranges pretty well round the circle of the sciences, and is as popular as the most exacting could wish; in fact, on more than one occasion the author ruthlessly sacrifices his science on the altar of popular treatment, as when the child learns that mercury likes oxygen when it is hot, but has no liking for it when cold. The book would have pleased us better had the simpler and more truthful statement of mutual attraction been put forward without any suggestion of liking or disliking, which must inevitably suggest volition and so defeat the main object of the book, viz., to give correct, if simple, notions of science. It is only fair to say that this fault is nowhere conspicuous except in the chemistry section.

MESSRS. CHAPMAN AND HALL, LIMITED.

Handbook for Bio-Chemical Laboratory, by John A. Mandell. Students of physiology, zoology, and biology will welcome this little book as calculated to lighten their labours very materially. As may be surmised from the title, the book gives a list of the more or less special tests to be used in biological research. We have gone over the greater part of these tests, and we find the list both comprehensive and thoroughly reliable, which is perhaps the highest praise that can be bestowed upon such a work.

Elements of Differential Calculus, by Edgar W. Bass, Professor of Mathematics in the U.S. Military Academy. 'This text-book,' the author tells us, 'has been prepared for the use of the cadets of the U.S. Military Academy, who begin the subject with a knowledge of the elements of Algebra, Geometry, and Trigonometry which ranges from fair to excellent.' Comparing it with English text-books of a corresponding grade, we find the chief differences to lie in the greater exactness with which the fundamental and supremely difficult conceptions of the calculus are treated, and in a decided preference for the notation of 'differentials' rather than that of 'differential coefficients.' We are not clear that in either of these points our author is on firm ground in a book which disclaims being a treatise, and is confessedly for beginners. He spends some sixty pages in a most painstaking examination of the doctrine of limits, and these pages, we fear, would produce in the average student a distaste for the whole subject. It is work that must be done, no doubt, but need it be at the forefront of the subject? Is it not absolutely essential that a complete examination of the fundamental laws of a mathematical subject should be deferred until some such progress has been made as shall suffice for the pupil to see the general drift of the subject which he is studying? No one thinks of examining whether space is or is not homaloidal before commencing to teach Euclid. Certain assumptions are made which justify themselves to 'common sense,' and the examination of the logical basis of common sense is deferred until later. So in Algebra, we study the laws of operation last, and not first. We think that a wise teacher will do the same in the Differential Calculus, and defer much of what is needed to render

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As to our second point, we scarcely regard Professor Bass as consistent with himself. 'My experience,' he says, 'leads me to the belief that the more rigorous and comprehensive method of infinitesimals is suitable only for a treatise, and not for a text-book intended for beginners.' Yet we find such equations as—

$$\frac{d^n y}{dx^n} = d^r \left(\frac{d^n - {}^r y}{dx^n - r}\right) = f^n(x) dx^r,$$

and many others, where the whole symbolism is that of infinitesimals. For beginners we are clear that this is a mistake. Even those whose 'knowledge of the elements of Algebra, Geometry, and Trigonometry ranges from fair to excellent' are apt to be led by such equations into habits closely akin to that which every teacher to his sorrow knows something of, 'cancelling the *d*'s.'

Despite Professor Bass's attention to logical minutiæ, there are several errors of statement in his book. Surely in no fair sense can $4ax$ be called a function of 4 (p. 3). Attention should be directed to the Branche Pointillée of the logarithmic curve (p. 342), as also of the curve figured at the top of p. 342, *i.e.*, $y = \frac{1}{e^x}$. Both these curves repeat themselves in branches pointillées, the first to the left of the axis of y, the second below the axis of x. So again with Ex. 5, p. 281, and in other places. But Professor Bass, so far as we have seen, does not make any mention of such branches, though he has an admirable opportunity of so doing on p. 288 when treating of Points d'Arrêt, since the existence of the one involves the other.

It would be ungracious not to refer to the many excellences of the book. Though we do not consider it a useful book for the beginner of modest mathematical attainments, and though it is handicapped by the high price at which it is placed on the English market (more than twice the price of Williamson, though a less bulky volume), yet we think that it would prove most stimulating reading for one who had already mastered one of our English treatises, and who could profit by the freshness with which the subject is treated, and the wealth of illustration, in short, by a change of the point of view which emphasises more than anything which we have recently seen the growing divergence between English and American Mathematics.

Diagrams of Terrestrial and Astronomical Objects and Phenomena, by R. A. Gregory, F.R.A.S. The collection of diagrams will be found extremely useful by teachers of Physiography, as the main parts of elementary physiography are illustrated. Students familiar with Mr. Gregory's 'Physiography' will recognise many of the diagrams, which are enlargments of those given in this work, with which they may, therefore, be profitably used. The sheets sent in for review are on ordinary paper, a fact greatly to be deplored, since the wear and tear of a few weeks' use will reduced the diagrams to a dog-eared condition, calculated to militate against their endurance. In these days of colour printing, it is surprising that these diagrams, good as they are in their present form, should not have been made excellent by judicious colouring. We should advise Mr. Gregory to see to these two points, should a second edition, as is most likely, be called for in the near future.

MESSRS. J. AND A. CHURCHILL, LONDON.

Elementary Practical Chemistry, by Messrs. Clowes and Coleman. This is another of the many text books due to the remodelled syllabus of the Science and Art Department. It is a *vade mecum* to the examination in Elementary Practical Chemistry of the Department, and also a laboratory book for Organised Science Schools. The book is well calculated to fulfil its purpose, as it covers the whole of the ground over which the elementary student should travel, and puts forward the steps to be followed with clearness and precision. As is usual, but none the less regrettable, the main part of the book is devoted to qualitative analysis. We should have been better pleased had less space been given to this greatly over-rated branch of chemical science and further space devoted to the observational and quantitative sides. The general get-up of the book leaves little or nothing to desire, paper, printing, and binding being uniformly good, so that the book is in every respect as worthy of adoption as any of its kind in the market.

Elementary Quantitative Analysis, by Clowes and Coleman. Now that Quantitative Analysis is exacted from all candidates for the Science and Art Department's Certificates in Practical Chemistry, a much more widespread interest in such books as the above is prevalent than was formerly the case. The authors have been well advised in preparing a course of quantitative work fairly exhaustive yet not too voluminous. We have gone through the book with pleasure, and we have nothing but praise to bestow upon it. To South Kensington Students of the Advanced and Honours stages, and to all whose lot it is to precipitate and dry and weigh, to standardise and to titrate and to test, we recommend the volume under review as excellent for their purpose.

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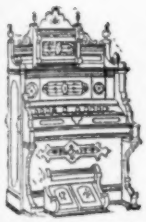

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~~And if there ever were a tear~~

~~From passion's dross refined and clear,~~

~~A tear so limpid and so meek. It~~

~~scarce would stain an angel's cheek.~~

~~'Tis that which~~ by pious father shed. 12

scarce would stain an angels cheek.

'Tis that ~~which~~ by pious father shed. 12

~~Upon a duteous daughter's head.~~

~~O Music! sphere descended maid.~~

~~Friend of pleasure, Wisdom's aid.~~

Good

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APRIL 1897.

PRINTED BY EYRE & SPOTTISWOODE, *Her Majesty's Printers*, DOWNS PARK ROAD, N.E.
PUBLISHED BY THE PROPRIETORS AT THE OFFICE OF 'THE PRACTICAL TEACHER,' 33, PATERNOSTER ROW, LONDON, E.C.